TRENDS IN EPIDEMIOLOGY, MORBIDITY PATTERN AND OUTCOME OF CHILDREN WITH MEASLES IN A TERTIARY CARE CENTRE IN SOUTH INDIA

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INSTITUTE OF CHILD HEALTH AND

HOSPITAL FOR CHILDREN

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CERTIFICATE

This is to certify that dissertation entitled "**TRENDS IN EPIDEMIOLOGY, MORBIDITY PATTERN AND OUTCOME OF CHILDREN WITH MEASLES IN A TERTIARY CARE CENTRE IN SOUTH INDIA"** submitted by **DR. BHARANIKUMAR R** to the Faculty of Paediatrics, The Tamil Nadu Dr . M.G.R. Medical University, Chennai in partial fulfillment of the requirement for the award of M.D. Degree (Paediatrics) is a bonafide research work carried out by him under direct supervision and guidance.

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DECLARATION

I **Dr.BHARANIKUMAR R** solemnly declare that the dissertation titled "**TRENDS IN EPIDEMIOLOGY, MORBIDITY PATTERN AND OUTCOME OF CHILDREN WITH MEASLES IN A TERTIARY CARE CENTRE IN SOUTH INDIA**" has been prepared by me. This is submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the rules and regulations for the M.D degree examination in Paediatrics.

Dr. BHARANI KUMAR R

PLACE : Chennai

DATE : 7.10.15

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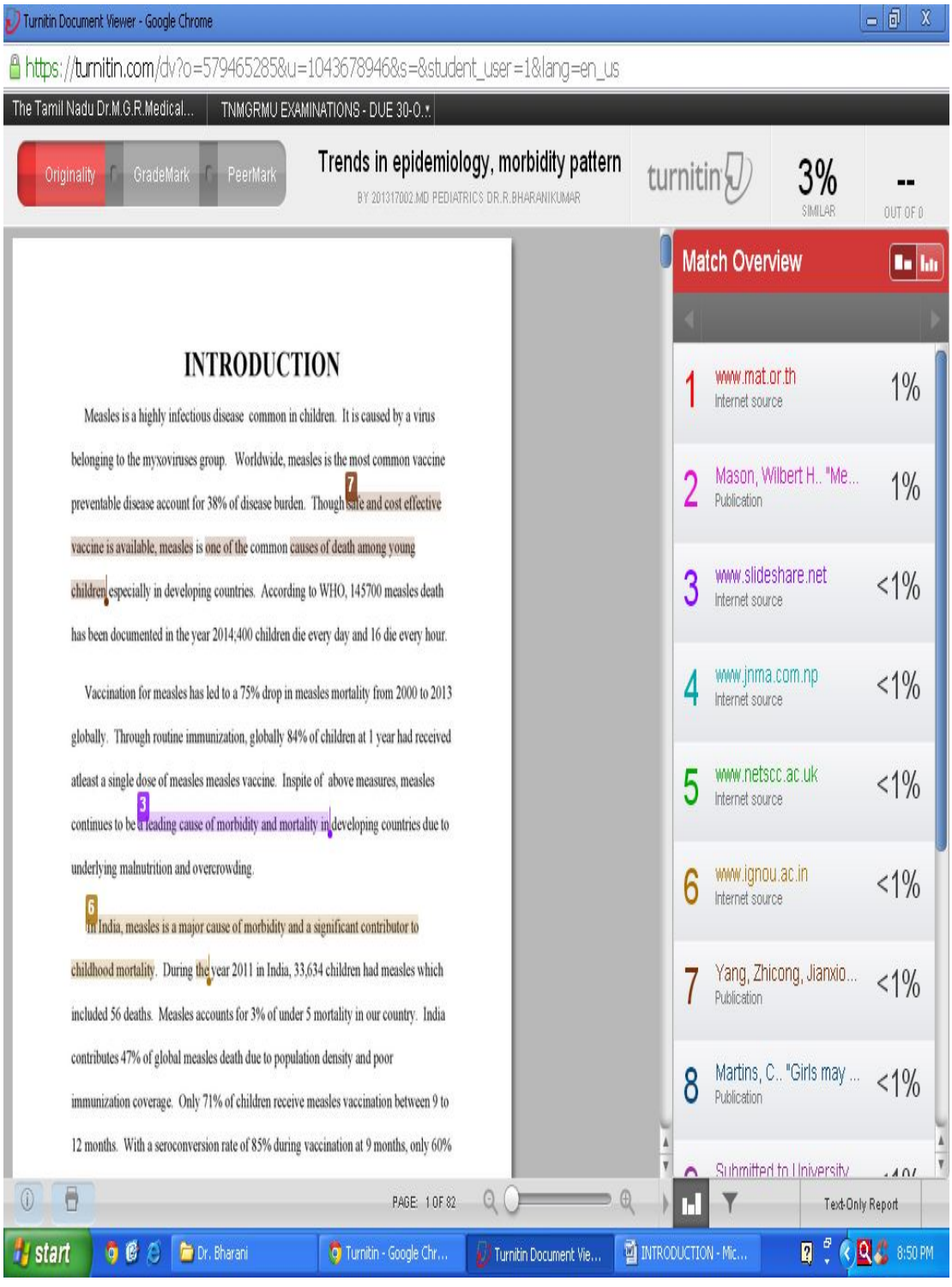
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INTRODUCTION
Measles is a highly infectious disease common in children. It is caused by a virus belonging to the myxoviruses group. Worldwide, measles is the most common vaccine preventable disease account for 38% of disease burden. Though safe and cost effective vaccine is available, measles is one of the common causes of death among young children, especially in developing countries. According to WHO, 145700 measles death has been documented in the year 2014;400 children die every day and 16 die every hour.
Vaccination for measles has led to a 75% drop in measles mortality from 2000 to 2013 globally. Through routine immunization, globally 84% of children at 1 year had received atleast a single dose of measles measles vaccine. Inspite of above measures, measles continues to be a leading cause of morbidity and mortality in developing countries due to underlying malnutrition and overcrowding.
In India, measles is a major cause of morbidity and a significant contributor to childhood mortality. During the year 2011 in India, 33,634 children had measles which included 56 deaths. Measles accounts for 3% of under 5 mortality in our country. India contributes 47% of global measles death due to population density and poor immunization coverage. Only 71% of children receive measles vaccination between 9 to 12 months. With a seroconversion rate of 85% during vaccination at 9 months, only 60%
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INTRODUCTION

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ABSTRACT

TRENDS IN EPIDEMIOLOGY, MORBIDITY PATTERN AND OUTCOME OF CHILDREN WITH MEASLES IN A TERTIARY CARE CENTRE IN SOUTH INDIA

BACKGROUND

Measles is the most common vaccine preventable disease worldwide accounting for 38% of disease burden. In India, measles is a major cause of morbidity and a significant contributor to childhood mortality. India contributes to 47% of global measles death. Increase in immunization coverage has led to change in epidemiology of measles.

AIMS AND OBJECTIVES

To study the trends in demographic profile of children presenting with measles, their morbidity pattern and clinical outcome attending a tertiary care centre in South India. To determine the course of measles based on various host factors – age, nutritional status, socio economic status, immunization status and other host factors in the era of increased vaccination coverage.

METHODOLOGY

A prospective descriptive study was done in Institute of Child Health and Hospital for Children, Egmore. The study period was from February 2015 to August 2015. 122 children with clinical features suggestive of measles and positive Ig M measles antibody were included in the study. The demographic details of the children like age, sex, residence, socio economic status, chronic illness were obtained. Nutritional status of the child was assessed and the presenting symptoms and signs were documented. Complications, management required, length of hospital stay and final outcome of disease were recorded.

RESULTS

The common age group of children with measles was between 9 months to 2 years (32%). 26.3% of children with measles were less than 9 months of age, before the age of measles immunization. Male to female ratio was 1.10:1. 63.9% of cases were from

urban areas. Children were from Lower middle (60.7%) and upper lower (33.6%) socio economic class. 32.8% cases occurred in March and 23.8% in April. 35.2% were unimmunized, 61.5% had single dose of immunization and 3.3% had 2 doses of immunization. Most common symptoms were fever (96.7%), cough (87.7%), coryza (80.3%). 7.4% had severe acute malnutrition and 32% had moderate acute malnutrition. 26.2% children developed complications. The most common complication was pneumonia (56.3%) followed by febrile seizures (25%) and diarrhea (15.6%). There was a significant association between malnutrition and development of complications (p 0.002). Average length of stay was 5.04 days. 88.5% children had complete recovery and 11.5% left against medical advice. There was death in the study population due to measles and its complications.

CONCLUSION

26.3% of children with measles were less than 9 months old, before the age of vaccination. Malnutrition was significantly associated with development of complications. Pneumonia, febrile seizures and diarrhea were the common complications. The overall clinical outcome was good with no mortality. Measles vaccination when given at 6 months (seroconversion rate of 76%) may reduce the incidence the measles till the routine vaccination at 9 months which requires further studies.

INTRODUCTION

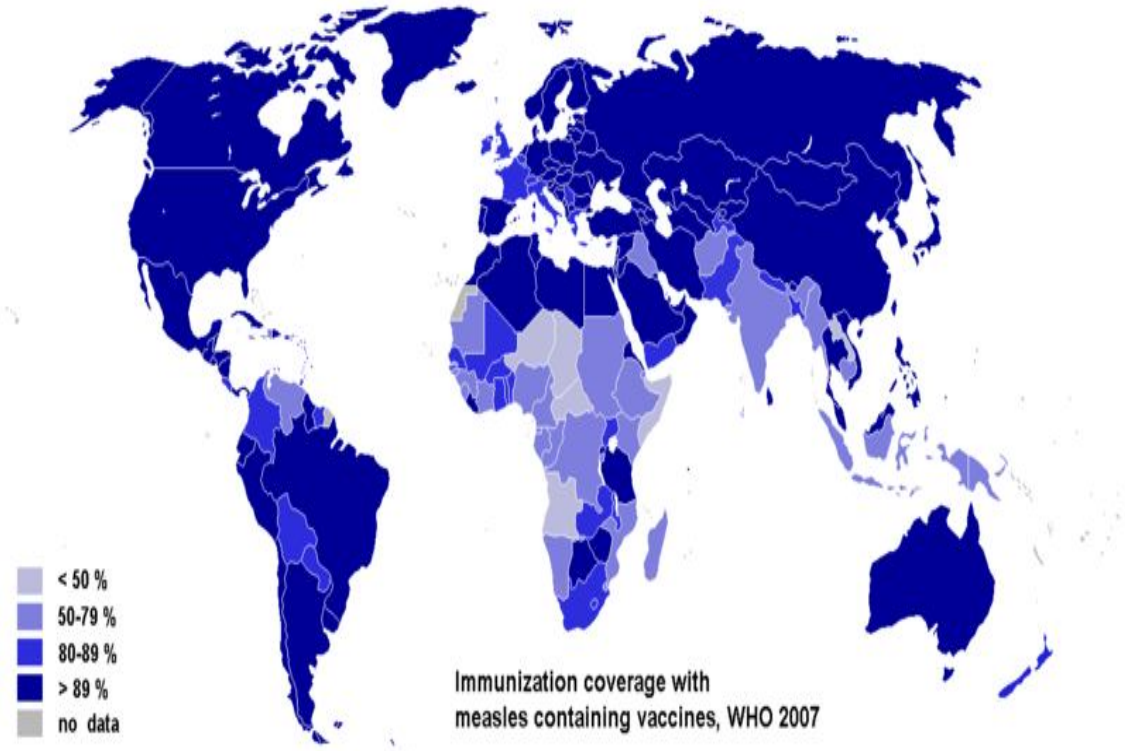
Measles is a highly infectious disease common in children. It is caused by a virus belonging to the myxoviruses group[1]. Worldwide, measles is the most common vaccine preventable disease accounting for 38% of disease burden[3,12]. Though safe and cost effective vaccine is available, measles is one of the common causes of death among young children especially in developing countries[2]. According to WHO, 145700 measles death have been documented in the year 2014, 400 children die every day and 16 die every hour[3,4].

Vaccination for measles has led to a 75% drop in measles mortality from 2000 to 2013 globally[5]. Through routine immunization, globally 84% of children at 1 year had received atleast a single dose of measles measles vaccine. Inspite of above measures, measles continues to be a leading cause of morbidity and mortality in developing countries due to underlying malnutrition and overcrowding.

In India, measles is a major cause of morbidity and a significant contributor to childhood mortality[2]. During the year 2011 in India, 33,634 children had measles which included 56 deaths. Measles accounts for 3% of under 5 mortality in our country[7]. India contributes 47% of global measles death due to population density and poor immunization coverage[11]. Only 71% of children receive measles vaccination between 9 to 12 months. With a seroconversion rate of 85% during vaccination at 9 months, only 60% children are protected at 9 months. Remaining 40% children remain susceptible to measles which leads to epidemics[6].

Problems in eliminating measles are

- Poor immunization coverage
- Highly contagious disease
- Changing epidemiology of measles
- Need for catch up vaccination



The targets set for 2015 by WHO to eradicate measles are[5]

- Improve vaccination coverage - ≥ 90% receive first dose of measles vaccine.
- Reduce the incidence to 5 cases per million
- Reduce mortality by ≥ 95% compared to the year 2000.

Measles caused immunosuppression which further leads to complications. The common complications are diarrhea, pneumonia, otitis media and neurological complications like encephalitis and febrile convulsions. Increase in immunization coverage has led to change in epidemiology of measles.

Measles is caused by a RNA virus belonging to paramyxovirus group. It causes exanthematous disease characterized by fever, cough, coryza, conjunctivitis, maculopapular rashes and a pathognomic enanthem. Measles has no animal reservoir. It is exclusively a disease of humans[10].

HISTORY

Measles is an ancient disease with epidemics of measles described 1800 years ago in the Roman empire and China. In ancient times, measles was frequently confused with other exanthematous diseases like small pox. Only in the 17th century (1629) measles was considered as a separate entity. In 1690 Thomas Sydenham clearly described features of measles in English medical literature. During the 17th and 18th century, epidemics involved persons of all ages including neonates. Due to reduction in interval between the epidemics there was reduction in age specific incidence of measles.

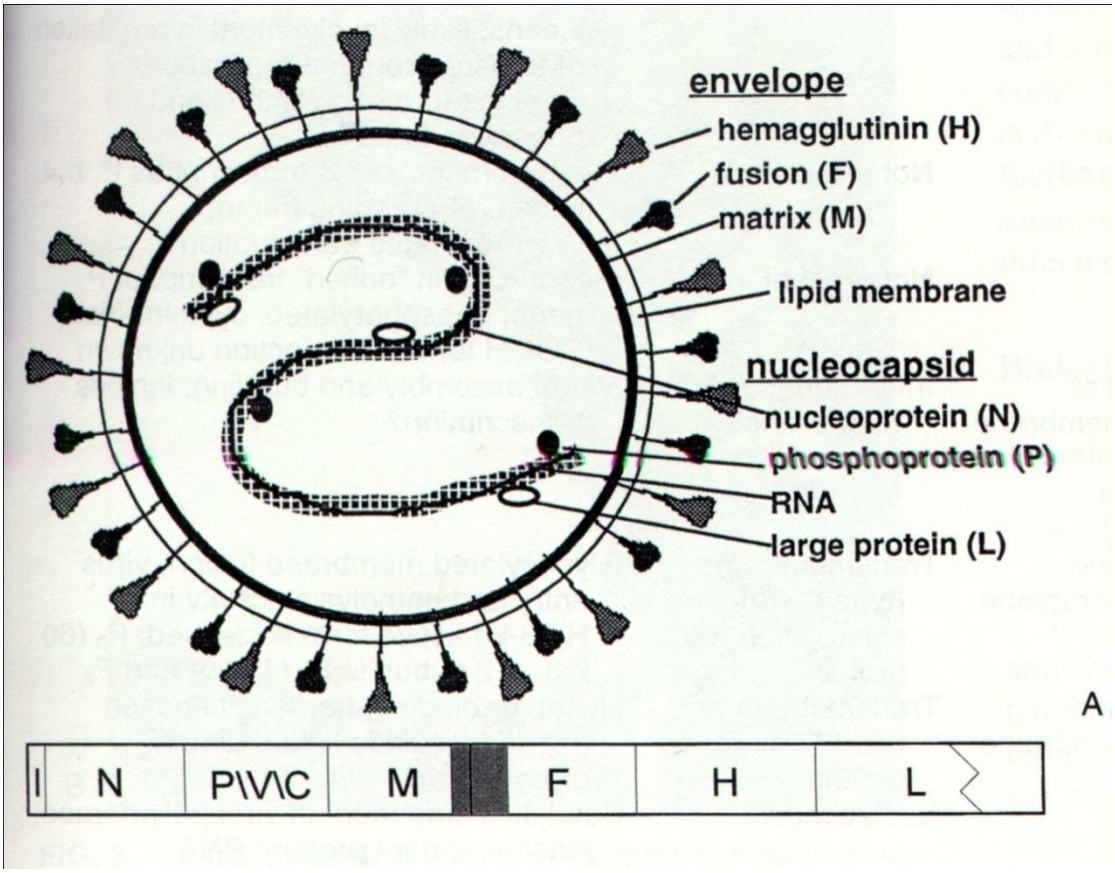
Peter Panum, a Danish medical student studied the epidemic of measles in Faroe Islands in 1846. This laid the foundation for the scientific knowledge about measles. Panum from the study inferred that the disease spread only through human-to-human transmission via the respiratory route and the

incubation period is around 14 days and once infected people acquire lifelong immunity[10].

Koplik in 1896 described the enanthem of measles which is now considered the pathognomonic sign of measles. Tissue culture vaccines both inactivated and attenuated were developed and came in to general used from 1963.

MEASLES VIRUS

Measles is relatively a large virus 120-150nm in diameter with symmetry of helical capsid. It has a RNA genome. It belongs to the genus Morbillivirus who are members of the family Paramyxoviridae. Measles virus does not have neuraminidase activity like other members of paramyxovirus family but has hemagglutination property. The virus is composed of inner helical nucleocapsid and outer lipoprotein envelope. The envelope has three proteins – F protein involved in fusion of virus, H protein for hemagglutination and M protein for maturation of the virus[10].



The measles virus can be grown on human or monkey kidney and human amnion cultures which can be used for primary isolation of the virus. These isolates can be grown on continuous cell lines and in the amniotic sac of hen's eggs. In measles infection both nuclear and cytoplasmic inclusion bodies are seen. Measles virus is heat labile and is readily inactivated by heat, uv light, ether, chloroform and extremes of pH. The virus can be stabilized by magnesium sulphate. After stabilization, the vaccine can be stored at -70˚C for 5 or more years.

Measles virus is antigenically related to canine distemper virus and bovine rinderpest virus. All measles strains have antigenic homogeneity.

Cross reactivity is present among the genus Morbillivirus but not in other members of the family Paramyxoviridae.

EPIDEMIOLOGICAL DETERMINANTS

AGENT FACTORS

- **AGENT:** RNA paramyxovirus with one serotype.
- **SOURCE OF INFECTION:** A case of measles. There are no carriers and no animal reservoir.
- **SPREAD OF INFECTION:** Infection is spread through the respiratory route. Greatest infectivity occurs during the prodromal stage of the illness. Transmission is through aerosolized droplets. Portal of entry is through nose and conjunctiva. 90% of susceptible individuals when exposed to a case of measles, acquire the disease.
- **COMMUNICABILITY:** Children with measles are highly infectious during the prodromal phase and eruption of rashes. Infectivity declines rapidly after the development of rashes. The infective period 4 days prior and 4 days after the onset of rash. Isolation of the child for 1 week after the onset of rash will prevent transmission of virus.
- **SECONDARY ATTACK RATE:** Measles virus has only one antigenic subtype. So, infection confers lifelong immunity. Hence, if a child presents with secondary attack then there is a error in diagnosis either initially or during the second illness

HOST FACTORS

- **AGE:** In developing countries measles affects children from 6 months of age. The common age of illness is between 6 months and 3 years. In developed countries the age of acquiring the disease is above 5 years
- **SEX:** Male and female are equally affected in measles. Though the incidence is same among both the sexes, the complication rates were higher in men when compared to women.
- **IMMUNITY:** Measles can occur at any age. No child is immune to the disease if they have not acquired immunity either through active or passive immunization. One attack give lifelong immunity. During infancy, upto 6 months of age, maternal measles antibodies provide passive immunity to the baby and may persist upto 9 months of age.
- **NUTRITION:** Malnourished children have severe form of measles with complications and contribute significantly to mortality. They are 400 times higher risk of mortality when compared to normal children. Malnourished children shed the virus for longer duration and hence contribute to the spread of infection to other children. Measles itself can precipitate malnutrition in health child after infection.

ENVIRONMENTAL FACTORS

Measles can spread in any part of the year. In tropical countries, the epidemics occur during hot and dry seasons (January to April). In temperate countries, it occurs in winter as people remain indoor which leads to crowding. In countries with low socioeconomic status, the disease affects children of younger age.

PATHOLOGY

Measles virus multiplies within the respiratory tract epithelium and casuing inflammation and necrosis. Lymphocytes infiltrate at the site of necrosis. There are multinucleated giant cells due to cell fusion which are of two types namely Warthin-Finkeldey cells and epithelial giant cells[1].

The Warthin-Finkeldey cells are present in the reticuloendothelial system like tonsils, adenoids, peyer patches, appendix, lymph nodes and spleen. They cotain 100 or more nuclei. Both cytoplasmic and nuclear eosinophilic inclusion bodies are seen. The epithelial giant cells are present in the respiratory epithelium and also over other epithelial surfaces.

The disease has 4 phases – incubation, prodromal phase, exanthematous phase and recovery. During incubation phase, the virus enters lymph node. Primary viremia occurs. Prodromal phase starts after secondary viremia. During this period necrosis and giant cells formation occur. Necrosis occurs by multiplication of the virus and fusion of the cells. Antibody production starts after the onset of rash. The virus also affects the CD4 T cells resulting in immunosuppression.

COURSE OF MEASLES VIRUS INFECTION

DAY	EVENT
0	Measles virus enters through the nasopharyngeal epithelium and replicates
1-2	Virus reaches regional lymph nodes
2-3	Primary Viremia
3-5	Virus multiplies at respiratory epithelium, reticuloendothelial system and sites of spread
5-7	Secondary Viremia
7-11	Involvement of skin, respiratory system, CNS and other organs
11-14	Virus is present in respiratory tract, skin, CNS and other organs
15-17	Viral load decreases and diminishes

CLINICAL MANIFESTATIONS

The natural history of measles has three phases – prodromal, eruptive and recovery phase. The incubation period of measles is 10 days (9-11days). Children are usually asymptomatic during the first 10 days of infection

PRODROMAL PHASE

The prodromal phase of measles lasts for 4 days from day 10 to day 14 of infection. Children have the characteristic features of fever, malaise, cough, coryza and conjunctivitis. The symptoms worsen over a period of 2 to 4 days.

Fever spikes rise upto 103 F. The nasal symptoms are similar to any other respiratory infection like common cold and pharyngitis. Children have sneezing, running nose and redness of eyes. The conjunctivitis is associated with lacrimation and photophobia. Cough will be severe and disturbing and have a brassy quality.

One or two days prior to the onset of rash, koplik spots appear which are the pathognomonic sign of measles. They appear as bluish white spots on a red base in the buccal mucosa and even in the conjunctiva and the vaginal mucosa. They first appear in the buccal mucosa opposite the lower first and second molars and later involve other parts of the mucosa. They are the size of pin heads 1mm but sometimes coalesce to form large ones.

ERUPTIVE PHASE

The eruptive phase starts around day 14 of infection. The prodromal symptoms like cough, fever, koplik spots peak during the appearance of rash and later subside after the onset of rash. The rashes first appear behind the ear and over the forehead beneath the hairline. Then they spread in centrifugal fashion. In 3 days, the rashes appear in face, neck, trunk, upper and lower extremities in the same order[1].

The exanthem is an erythematous maculopapular rash. They are discrete in the extremities whereas they become confluent in the face and upper trunk. By day 3 or 4 after the appearance, the rash starts resolving in the same centrifugal course as it appeared. During this stage, there is desquamation of skin in the confluent areas and brownish discolouration of skin. Fever, conjunctivitis and cough subside by 3rd day of onset of rash. Persistence of fever, respiratory symptoms beyond this period suggests secondary bacterial infection and complications. Children can also have vomiting, diarrhea, pharyngitis and laryngitis.

RECOVERY PHASE

Post measles even a healthy child will lose weight and may be week for varying periods. Some children may develop complications due to immunosuppression following measles infection and the underlying nutritional deficiency in the child. Growth will be affected and the child can have chronic diarrhea and reactivation of pulmonary tuberculosis[2].

ATYPICAL MEASLES

Subclinical and inapparent measles infection occurs in some vaccinated children and in some infants who receive the measles antibodies passively. They do not shed the virus and not involve in the transmission of the disease. Some children who have received the formalin inactivated measles vaccine had developed severe form of atypical measles. Children had high grade fever with headache, the rashes became petechial and appeared in a centripetal fashion. The atypical measles was associated with complications like pneumonia and pleural effusion. The pathogenesis postulated for atypical measles is the formation of circulating immune complex due to abnormal immune response to vaccination[1].

LABORATORY DIAGNOSIS

Measles is often diagnosed clinically by the presence of characteristic features. During the prodromal phase, multinucleated giant cells can be demonstrated form the nasal secretion by Giemsa stain. The antigen can also be detected from the secretion by immunofluoresence technique. Virus can be

isolated from nasal, throat, conjunctival secretions, blood and urine during the prodromal phase.

Serological studies are the commonly used to confirm the diagnosis of measles. Demonstration of Measles specific IgM antibodies can be done using ELISA. The IgM antibodies become positive 1 to 2 days after the onset of rash and remain in the serum for one month. Serologic confirmation can also be done by demonstrating four fold rise in Ig G titres from sample taken during the acute illness and 2-4 weeks later. Serological studies are done to only confirm the diagnosis and they do not affect the management.

DIFFERENTIAL DIAGNOSIS

- Rubella
- Adenoviruses
- Enteroviruses
- Infectious mononucleosis
- Exanthem subitum
- Erythema infectiosum
- Mycoplasma pneumonia
- Group A streptococcus
- Kawasaki syndrome
- Drug eruptions

COMPLICATIONS

Measles damages the respiratory system and suppresses the immune system which leads to complications. In developing countries several other factors like malnutrition, overcrowding and poor immunization coverage[12]. Complications and death are more common in young children (especially < 1 year of age) and adults (>20 years of age).

In overcrowded places, children get inoculated with large doses of viral load from the reservoir. Malnutrition causes poor immune response which adds to the prevailing immunosuppression caused by the disease perse leading to increased rates of morbidity and mortality.

Measles causes a decrease in the serum retinol concentrations. Children with low retinol levels have higher risk of developing complications and death

when compared to normal children. Immunocompromised persons when infected with measles have severe complications. 58% develop pneumonia and 20% have encephalitis.

PNEUMONIA

Pneumonia is the major cause contributing to mortality in children with measles. Pneumonia can develop either by direct viral infection or by secondary bacterial infection. Measles virus causes **giant cell pneumonia.** Radiograph in viral pneumonia is characterized by diffuse patchy infiltrates and hyperinflated lung fields

The bacterial pathogens causing pneumonia are

- Streptococcus pneumonia
- Hemophilus influenza
- Staphylococcus aureus.

In either form of pneumonia the death occurs due to the development of bronchiolitis obliterans.

OTHER RESPIRATORY MANIFESTATIONS

- Croup
- Tracheitis
- Bronchitis
- Pharyngitis
- Laryngitis
- Otitis media – most common complication associated with measles.
- Mastoiditis

- Sinusitis
- Retropharyngeal abscess
- Reactivation of pulmonary tuberculosis in a child infected with TB.

GASTROINTESTINAL MANIFESTATIONS

- Diarrhea with dehydration
- Vomiting
- Appendicitis – lymphoid hyperplasia obliterates the lumen of appendix

The epithelium of gastrointestinal tract shows giant cells

CNS MANIFESTATIONS

Febrile seizures have been reported in 3% of children with measles

Encephalitis

Children developing encephalitis following measles infection have a poor outcome[1,12,13]. Encephalitis develops during the period of eruptive phase and some cases have been reported to manifest in the prodromal phase. Encephalitis is commonly reported in adolescents than young children.The pathogenesis behind encephalitis is unclear. Post infectious autoimmune damage has been postulated to be the cause of encephalitis

The clinical manifestations of encephalitis are

- Seizures (56%)
- Lethargy (46%)
- Coma (28%)
- Irritability (26%)

Other manifestations include Cerebellar ataxia, myelitis, retrobulbar neuritis and hemiplegia. Long term sequelae are mental retardation, deafness and motor weakness.

CSF examination will reveal elevated mononuclear cells with mild elevation of protein and normal glucose. Mortality in measles encephalitis is 15% and 20-40% children develop long term sequelae.

In immunocompromised persons, encephalitis occurs due to direct invasion of the virus in brain tissue. Subacute measles encephalitis occurs in children with AIDS, malignancy and immunosuppresion. These children will present between 1-10 months with seizures, stupor and coma, finally leading to death.

CARDIAC MANIFESTATIONS

- Myocarditis
- Pericarditis

OTHER MANIFESTATIONS

- **Hemorrhagic measles** also know as **Black measles** presents with hemorrhagic skin eruption and bleeding from nose, mouth and GI tract. The pathogenesis most like is said to be disseminated intravascular coagulation.
- Thrombocytopenic purpura
- Acute glomerulonephritis
- Corneal ulcer

- **Pregnancy** – Measles in pregnancy increases the morbidity and mortality in both mother and children. Pneumonia complicates pregnant mother. Spontaneous abortions, still births and premature delivery occurs. Congenital malformations in children have been reported. Congenital measles infection is severe and results in 30% mortality. Infants born to mother with measles are given passive immunization at birth.

TREATMENT

Measles management involves only supportive care. There is no specific anti viral therapy for measles. Supportive care is aimed at maintaining normal physiological status of the patient. Antipyretics are given for fever. Pneumonia is treated with oxygen, airway humidification, antibiotics and in rare circumstances ventilator support. Diarrhea is managed with oral rehydration solution. There is no use of prophylactic antibiotic therapy in measles. Ribavirin with IV gamma globulin have been tried in immunocompromised persons infected with measles and they have high mortality rate.

VITAMIN A ADMINISTRATION

In developing countries, children have low serum retinol level which is further aggravated by measles infection leading to corneal ulcer and blindness. Studies have shown a inverse relationship between serum retinol level and complications due to measles. Treatment of measles patients with vitamin A has shown a decrease in morbidity and mortality[2].

In India, measles patient receive two doses of vitamin A, on the day of diagnosis and the next day . Children having vitamin A deficiency are given an additional third dose at 4 to 6 weeks.

AGE	VITAMIN A DOSAGE
< 6 months	50,000 IU
6-11 months	1,00,000 IU
≥ 12 months	2,00,000 IU

PROGNOSIS

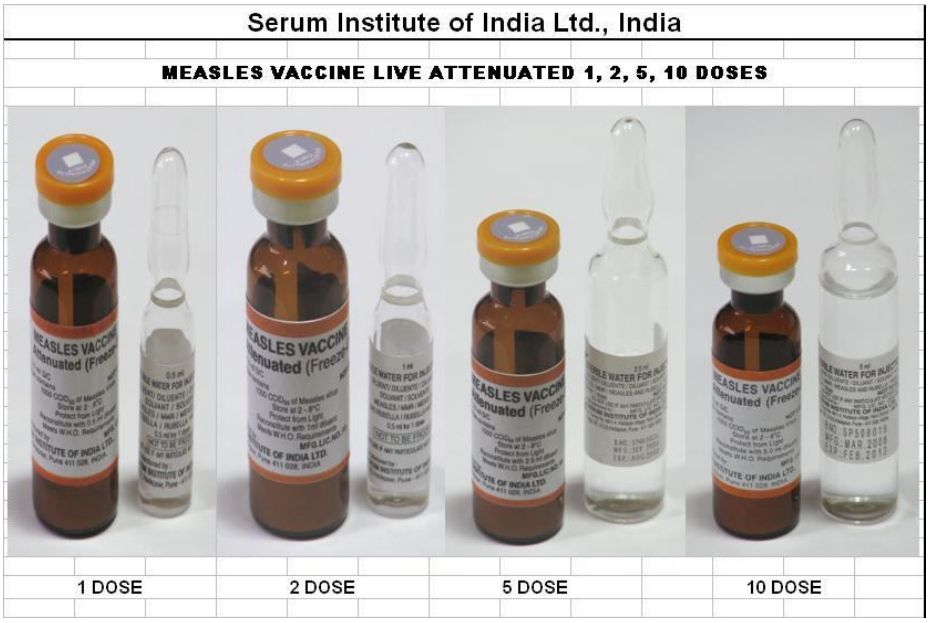
In developing countries, prognosis is determined by host factors like age, socio economic status, nutritional status and immunization coverage. With widespread usage of immunization, the incidence and mortality rates have dropped significantly. Majority of the children have uncomplicated measles. Pneumonia and encephalitis contribute to mortality in children.

PREVENTION

Children susceptible to measles infection should be prevented from contact with a case of measles. This can be achieved by isolation of children with measles during the infective period. Active and passive immunization are available for prevention against measles. As per WHO, Immunization coverage of 90% and above nationally is aimed to combat measles.

MEASLES VACCINATION

- **VACCINE:** Live attenuated vaccine formulated from Edmonston Zagreb stain is used in India. It is a lyophilized vaccine and is reconstituted with distilled water. It has no preservative. 0.5ml of vaccine contains 1000 infective units. Freeze dried vaccines can be stored for 2 years. Once reconstituted the vaccine must be used within 4 hours. Reconstituted vaccines can be stored at 2 to 8˚C as the vaccine is heat labile and is sensitive to sunlight. The vaccine at 1 hour, losses 50% of its potency at 20˚C and 100% of its potency at 37˚C[7].



- **AGE:** In India, first dose of measles vaccination is administered at 9 months age. In Tamil Nadu, a second dose of measles vaccination is administered along with DPT and OPV booster between 19-24 months. In case of an outbreak of measles, the first dose can be given at 6 months followed by a second dose at 9 months with a minimum interval of 4 weeks between two doses.

- **ADMINISTRATION:** Subcutaneous administration over the right upper arm
- **REACTIONS:** 15 to 20% of vaccinated children develop mild measles like illness. It is transient and the children are not infective
- **IMMUNITY:** Measles vaccine has a seroconversion rate of 90% when administered at 9 months and 99% when administered after 1 year. Antibodies are produced in 2 weeks of vaccination.
- **CONTRAINDICATIONS:** Immunocompromised children, HIV in advanced stage, malignancy**,** children on high dose steroids and antimetabolites. In asymptomatic susceptible HIV positive children in early stages of disease, the vaccine can be given as early as 6 months followed by two more doses at 9 months and 16 months

IMMUNOGLOBULIN:

Susceptible children exposed to a case of measles can be prevented from getting the infection by administration of immunoglobulin early in the incubation period preferably 3 to 4 days from exposure. The dose of immunoglobulin is 0.25ml per kg body weight. Live measles vaccine are given 8 to 12 weeks after passive immunization. Immunoglobulin are also administered to neonate born to mother with measles to prevent congenital measles[7].

REVIEW OF LITERATURE

Alphonsuset al[12] studied the clinical profile of children with measles in a secondary health care institution in Nigeria. 77 children with measles were studied over a period of 4 years. Diagnosis is made clinically. 3.1% of hospital admissions were measles. 47.8% of children were between 13 and 24 months. 18.1% were less than 9 months old. Only 22% of cases were vaccinated against measles. Cases were reported mostly during the dry season (80.5%). The two most common complications were bronchopneumonia (55.1%) and diarrhea with dehydration (13.0%).

Anis-ur-Rehman et al[13] studied the clinical outcome of patients with measles who were hospitalized with complications. 136 patients admitted in the hospital with complications of measles were included in the study. A thorough history, physical examination, immunization status and nutritional status were recorded and clinical outcome was compared with the above parameters. 60.3% of patients were male. Children immunized with measles were 57.3%. Malnourished children (71.35%) had a longer hospital stay (> 5 days). The common complications were pneumonia (39.7%) and diarrhea (38.2%). The number of children who died were 7 and the common cause for death was encephalitis (57.1%)

Ariyasriwatanaet al[14] studied the clinical presentations of persons with measles and its complications and compared the severity of complications with host factors like age, nutritional status and vaccination status. 156 children with measles who were admitted to Queen Sirikit National Institute of Child

Health were studied. Male to female ratio was 1.56:1. Median age of presentation was 1.5 years and mode was 8 months. Children below 2 years of age were59%; below 1 year were 40% and below 9 months were 23.9%. Only 44% of children were vaccinated against measles. 91.4% of children below 1 year of age were not vaccinated. 12.4% had mild PEM, 4.8% had moderate PEM, 2.1% had sever PEM. 9% of children had chronic diseases. The triad of cough, rash and coryza was found in 92.3% of cases. Pneumonia (62.2%) and diarrhea (38.1%) were the common complications. One child died of severe Pneumonia and ARDS. Diarrhea was more common among young children.

Raoteet al[15] in Mumbai studied the clinical profile of children hospitalized with measles for a period of one year. 150 children were taken up for the study. Children less than 1 year were 28%; between 1 to 3 years were 60%; 3 to 5 years were 8.6% and 5 to 7 years were 2.6%. Male to female ratio was 1.2:1. Grade I-II malnutrition was present in 36.6% children and grade III-IV PEM was present in 9.9% of children. More than half of the children had complications of which 15% had multisystem involvement. The complications were 50% - respiratory, 17.3% - nutritional detoriation, 14.6% - gastrointestinal and neurological and 1.3% - cardiac. Pneumonia, bronchitis, activation of TB, otitis and miliary tuberculosis were the respiratory complications. Encephalitis, convulsions and meningitis were the CNS complications. The incidence of complications and multisystem involvement were higher in children less than 1 year. Well nourished children had no

complications whereas PEM children had mild to severe complications depending on the grade of PEM.

Aurangazeb B et al[16] in Pakistan studied the clinical outcome of measles in children who were admitted with complications. It was a cross sectional study over a period of one year. 205 children with measles complications were included in the study. Details regarding demographic data, immunization and physical examination were recorded. Majority of children were male (61.5%). The mean age of presentation was 46.1 months. Of the 205 children, 57% were vaccinated against measles. Malnourished Children (71.2%) had a longer length of stay at hospital (p=0.010). The common complications were pneumonia (40.0%) and diarrhea (38.5%). Seven children in the study died. Statistically significant association was found between mortality and younger age (p=0.04), unvaccinated children (p=0.04) and children with encephalitis (p=0.00001).

Baba Usman Ahmaduet al[17] in Nigeria measured the maternal measles antibody titres in infants at seven months of age. Infants become susceptible to measles infection before the time of routine vaccination (9 months). This was attributable to low levels of maternal measles antibodies in children at 9 months. 136 children with age of seven months were studied. The children were term at birth, had no history of contact with measles or had a history suggestive of measles. Children enrolled were tested for maternal measles antibody titre (MMA) using enzyme linked immunosorbent assay. Male children were 50.7% and female 49.3% and ratio of male to female was 1.03:1.

Of the 136 infants studied, 125 (91.9%) infants had unprotective levels of maternal measles antibody at the age of seven months. The possible explanation for the decreased levels of MMA is that mothers in this era have a decreased amount of measles antibodies compared to prevaccination era. In present era, mothers having measles vaccine induced MMA are higher than measles virus induced MMA. Therefore children born to measles vaccinated mothers will get less amount of MMA by placental transfer and hence have low unprotective titres at 7 months of age. This accounts for the changing epidemiology of measles with more number of children getting measles within 9 months age (the timing of vaccination of measles). The possibility of explanation could not be confirmed as measles immunization in mother or history of measles in mother could not be obtained.

Jin D et al[18] studied the respiratory complications of measles children admitted in PICU. 17 children were studied between the age group of 2 months to 10 years. All the children required mechanical ventilation. 14 cases developed ARDS, 6 went in for tension pneumothorax and 3 developed bronchitis. 7 children died and 7 had complete recovery. Mortality was higher if measles children required PICU support and prognosis was poor. Laryngitis took longer time for recovery.

Abramson et al[19] studied the complications of measles in children required intensive care. 237 measles children were hospitalized of which 15 children developed complications requiring PICU care. All the 15 children required mechanical ventilation. Seven children developed ARDS, three had

spontaneous pneumothorax, two developed empyema. CNS complication namely encephalopathy was found in 7 children, five had sepsis. Four patients went in for long term sequelae. Four children died and the cause of death in all the four was ARDS. Measles children requiring intensive care had a higher rate of mortality and long term sequelae.

Sinha DP et al[20] studied the prevalence of measles in a West Bengal village for 5 years. Majority of the cases occurred between the months of May and august. Children were between 2 to 6 years of age and 91.5% of children were below 7 years of age. 181 children were enrolled. Two children with kwarshiorkar died of measles. There was no mortality among marasmic children. Clinical diagnosis of measles was difficult in malnourished children when compared to well nourished children.

Alwar AJ et al[21] studied 7447 cases of measles in an infectious disease hospital in Nairobi. The mortality rate was 17.5 per 1000 children. Among the death, 43.51% were below 1 year of age. Malnourished children had a longer length of hospital stay and higher rate of mortality when compared to healthy children.

Olatian AE et al[22] studied the seroprevalence of measles virus in children aged 0-8 months and children aged 9-23 months. The overall prevalence was 21.2%. 6.5% of children were between 0-8 months and 61.6% of children were between 9-23 months. Female children had a higher prevalence when compared to male. Child's vaccination status was significantly associated with prevalence of measles virus.

Aaby P et al[23] studied the effect of early vaccination for measles and survival of the children. Two doses of measles vaccine was given one at 4-6 months and second dose at 9 months of age. They concluded that mortality can be reduced in developing countries by vaccinating children at younger age in the presence of maternal measles antibodies, using 2 doses one at 4-6months and second dose at 9-12 months

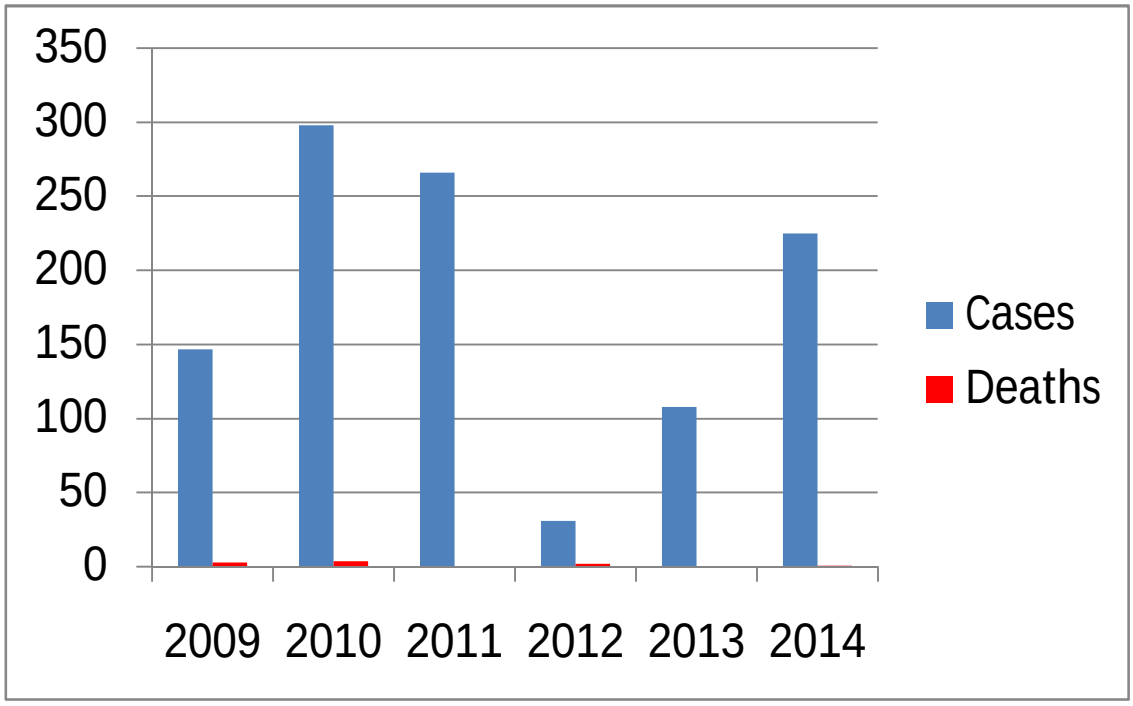
Ariyasriwatana C et al[24] studied the seroconversion rate of measles in infants immunized at 9 months of age. 70% of children vaccinated at 9 months of age had a seroconversion for measles. The antibody titres were significantly low at 18 months of age. Hence, a second dose of vaccination at 15 months of age boosts the antibody titres and protects the children from acquiring infection

Johnson CE et al[25] studied the measles antibody titres in children born to mother who have vaccine induced immunity against measles. 74% of children vaccinated at 6 month of age developed seroconversion – neutralizing antibodies whereas children immunized at 15 months of age had 100% seroconversion. Children vaccinated at 6 months of age when given a booster at 15 months of age, developed 100% seroconversion.

RATIONALE

- Measles is a major cause of morbidity and mortality among the vaccine preventable diseases
- Increase in immunization coverage has led to change in the epidemiology of measles
- Prognosis of measles is determined largely by host factors
- Studies are lacking regarding clinic-epidemiologic profile of measles after introduction of two doses of measles vaccination

INSTITUE OF CHILD HEALTH – STATISTICS ON MEASLES CASES AND DEATHS



AIMS AND OBJECTIVES

- To study the trends in demographic profile of children presenting with measles, their morbidity pattern and clinical outcome attending a tertiary care centre in South India
- To determine the course of measles based on various factor – age, nutritional status, socio economic status, immunization status and other host factors in the era of increased vaccination coverage.

METHODOLOGY

STUDY CENTRE

- Institute of Child Health and Hospital for Children, Egmore, Chennai.

STUDY DESIGN

- Descriptive study

STUDY POPULATION

- Children upto 12 years of age attending the Children's Hospital (ICH & HC) in Egmore

SAMPLE SIZE

- Total number of sample : **122 children**
- Sample size was calculated using the following formula

$$N = 4pq/d^2$$

Where,

N = Sample size

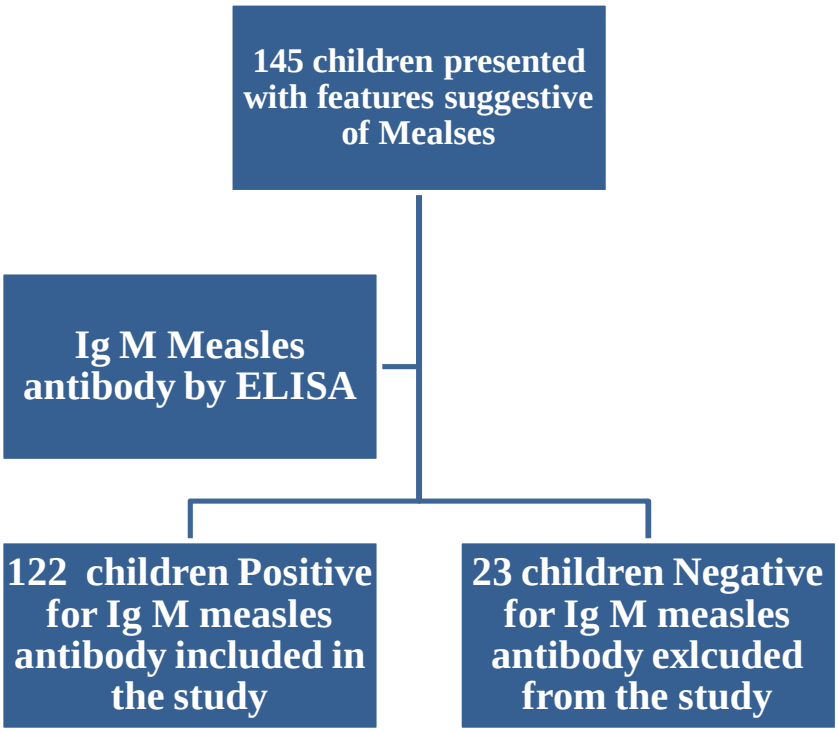
p = Prevalence

q = Complement of p (1-p)

d =Relative Precision (20%)

Prevalence	Estimated sample size
53	99

The prevalence for sample size calculation is derived from the study conducted by RaoteGh et al[15] where 53% of children presented with complications of measles.



DURATION OF THE STUDY

- February 2015 to August 2015

INCLUSION CRITERIA

All children ≤ 12 years of age presenting with maculopapular rash suggestive of measles with any of other features like

- Fever
- Cough
- Coryza
- Conjunctivitis

With **laboratory confirmation** of Measles by identifying **measles specific Ig M antibodies** using Enzyme Linked Immunosorbent Assay.

EXCLUSION CRITERIA

- Parents and guardians not willing to give consent for the study.

STUDY MANOEUVRE

- Children presenting to the hospital with clinical features suggestive of measles are enrolled in the study after getting informed consent from the parents.
- Blood samples (2 ml) are taken after consent from parents and are sent to Kings Institute, Guindy for serologic confirmation of measles. Ig M ELISA for measles is done.
- Children who are confirmed as measles by laboratory investigation (122 children) are included in the study. Children who presented with measles like illness and are negative for Ig M Measles antibodies are excluded from the study (23 children).
- Basic demographic details like age, sex, place of residence are collected in the proforma
- Children's place of residence has been recorded as coming from urban or rural areas
- Socio economic status of the Child's family is arrived using Modified Kuppusami Scale. They were categorized as belonging to one of the following – upper, upper middle, lower middle, upper lower and lower.
- Immunisation details of the child has been collected by viewing previous vaccination cards and treatment records.
- Children if suffering from any chronic illness , the details of the same are recorded

- The following complaints of the child has been obtained namely, fever, cough, coryza, conjunctivitis, day of onset of rash, diarrhea, seizures and other complaints
- Height, weight and mid arm circumference (1 to 5 years) of the children are recorded and the nutritional status was obtained by using WHO growth charts till 5 years of age and IAP charts above 5 years of age. The children are categorized in one of the following – severe acute malnutrition, moderate acute malnutrition, chronic malnutrition and no malnutrition
- Head to foot examination of the child has been done and signs like rashes, koplik spots, anemia and lymph adenopathy are noted.
- Children are examined thoroughly two times a day for emergence of new symptoms and signs or for the resolution of presenting signs/symptoms and complications, course of the disease in the hospital throughout their stay.
- The physiological status of the child was ascertained by measuring the heart rate, respiratory rate and perfusion and are labeled as either stable or unstable physiological status
- Unstable children are further categorized as respiratory distress or shock
- Complications of the child if present are recorded under the following – otitis media, pneumonia, diarrhea, febrile seizures, encephalitis and others

- Details of supportive management like like oxygen, IV fluids, antibiotics and others are recorded
- Length of stay of children in the hospital is obtained. The final outcome is recorded as one of the following parameters – complete recovery, disability, death and leaving against medical advice.
- Parents are counseled about nutritional supplementation, routine vaccination and preventive measures against spread of infection to other children. Follow up of the children are done at vaccine preventable diseases opd, ICH & HC, Egmore.

DATA ANALYSIS

145 Children presented to the vaccine preventable diseases outpatient department of ICH &HC with clinical features suggestive of measles (fever, cough, coryza, conjunctivitis and maculopapular rash). Of the 145 children, 122 children were confirmed as measles by serological examination namely Ig M Measles antibody by ELISA. The remaining 23 children who were negative for Ig M measles antibody were excluded from the study.

Data was collected using the proforma. Data was entered in excel sheet and analysis was done using statistical package for social sciences (SPSS) 20 version. Results of the descriptive data are presented in percentages. Chi Square test was used to compare the study variables with complications. P value of less than 0.05 was considered significant.

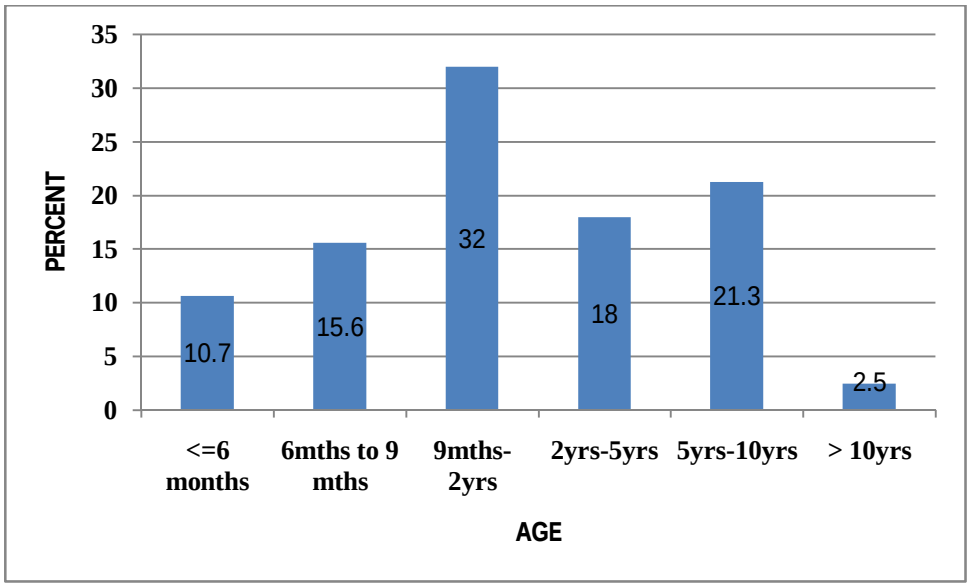
Observation

Age distribution of children with measles

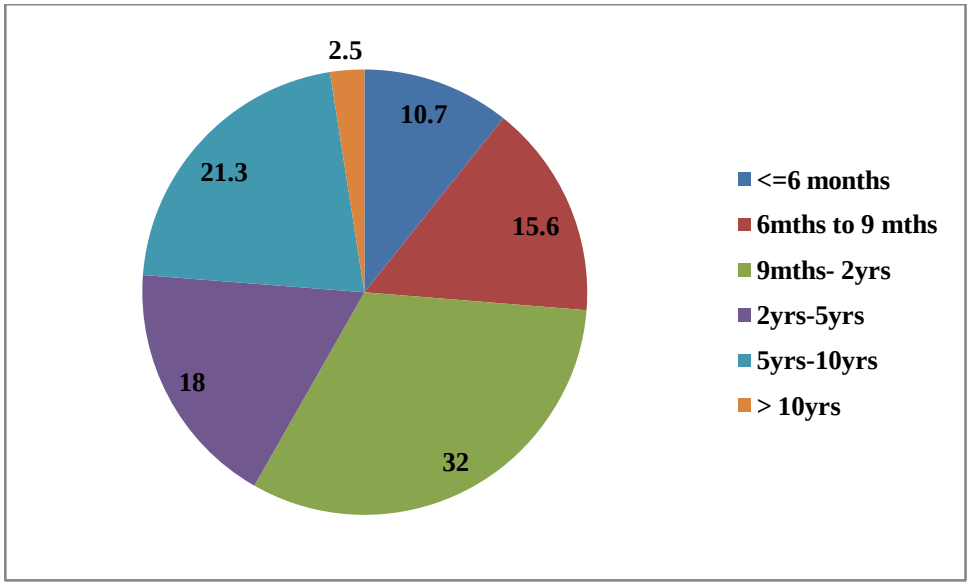
Age	Frequency	Percent
<=6 months	13	10.7
6mths to 9 mths	19	15.6
9mths- 2yrs	39	32.0
2yrs-5yrs	22	18.0
5yrs-10yrs	26	21.3
> 10yrs	3	2.5
Total	122	100.0

Among the 122 children with measles, 10.7% (13 children) were ≤ 6 months, 15.6% (19 children) were between 7 to 9 months, 32% (39 children) were between 9 months to 2 years, 18% (22 children) were between 2 to 5 years, 21.3% (26 children) were between 5 to 10 years and 2.5% (3 children) were more than 10 years

Distribution of age group



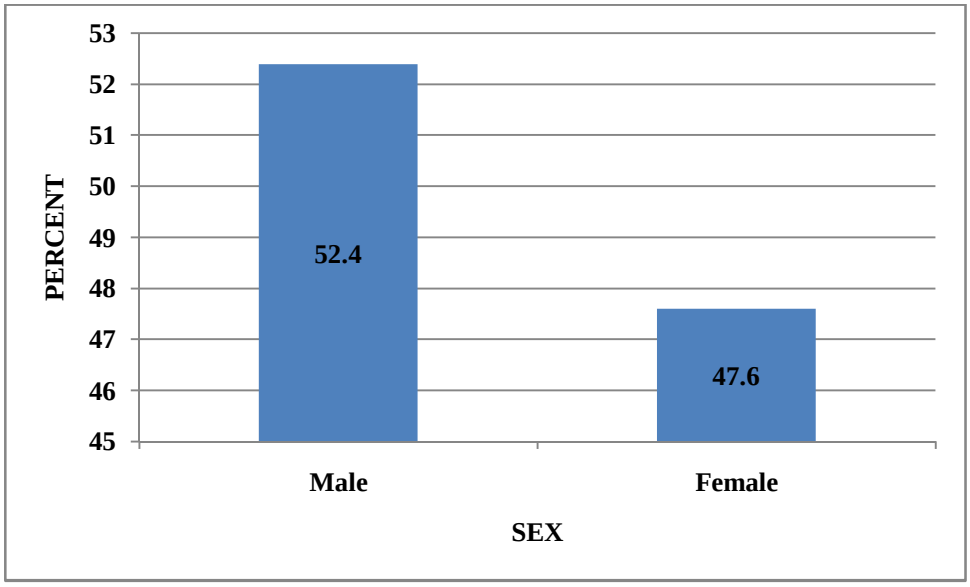
The common age group of measles was found to be between 9 months to 2 years (32%). 26.3% of children had measles before the age of immunization which is 9 months



Sex distribution of children with measles

Sex	Frequency	Percent
Male	64	52.4
Female	58	47.6
Total	122	100.0

The study population had 64 male(52.4%) and 58 female (47.6%) children. The male: female ratio is 1.10:1

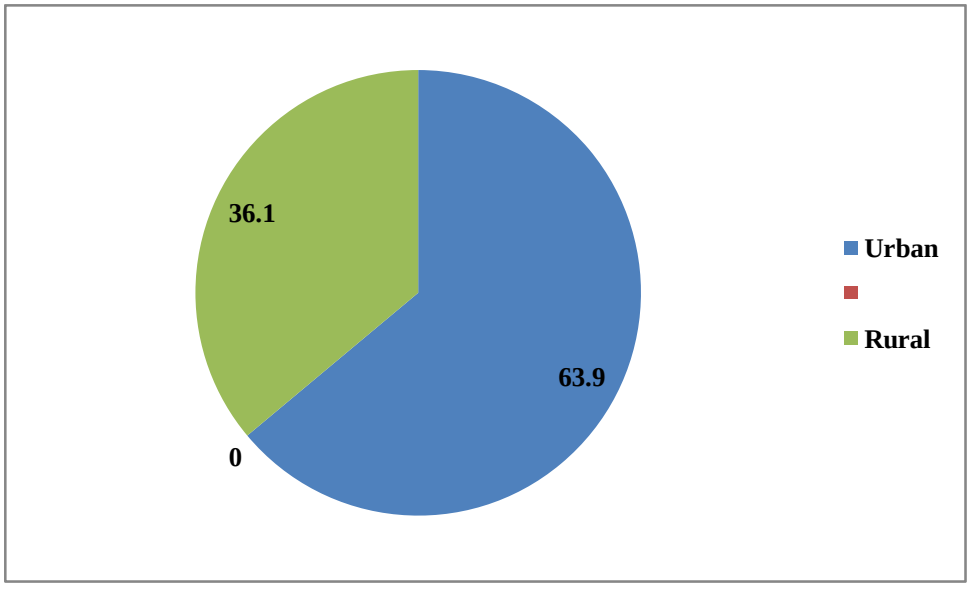


Sex distribution of study group

Place of residence of study population

Residence	Frequency	Percent
Urban	78	63.9
Rural	44	36.1
Total	122	100.0

Children presenting with measles from urban area was 63.9 % (78 children) and 36.1% of children were from rural areas around Chennai.

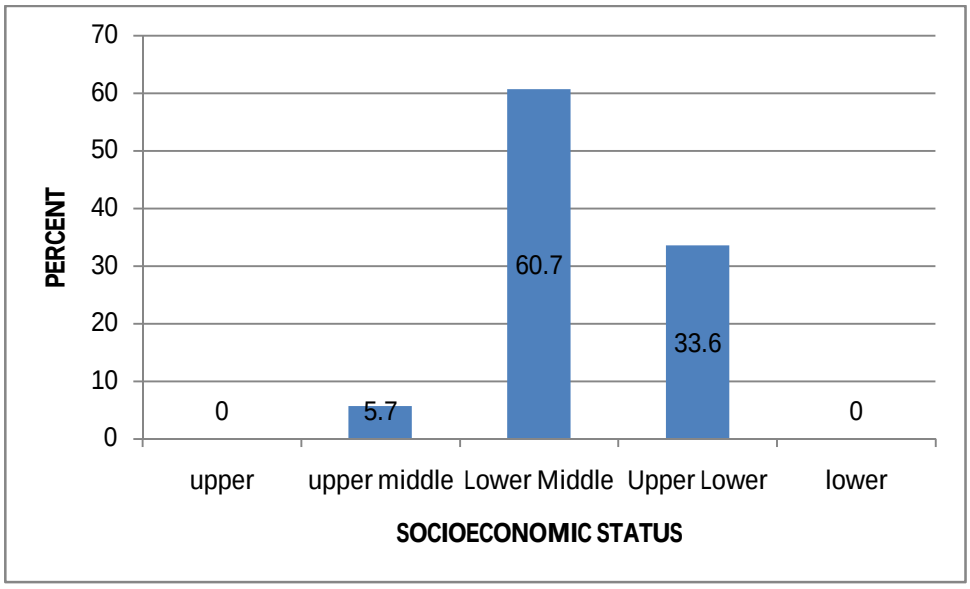


Distribution of Place of residence of study group

Socioeconomic status of the study population

Socioeconomic status	Frequency	Percent
Upper	0	0
Upper middle	7	5.7
Lower Middle	74	60.7
Upper Lower	41	33.6
Lower	0	0
Total	122	100.0

Lower middle class contributed majority of the socio economic status with 74 children (60.7%) in that group. 7 children (5.7%) were from upper middle and the second majority was upper lower with 41 children (33.6%). No children belonged to the upper and lower socio economic group.

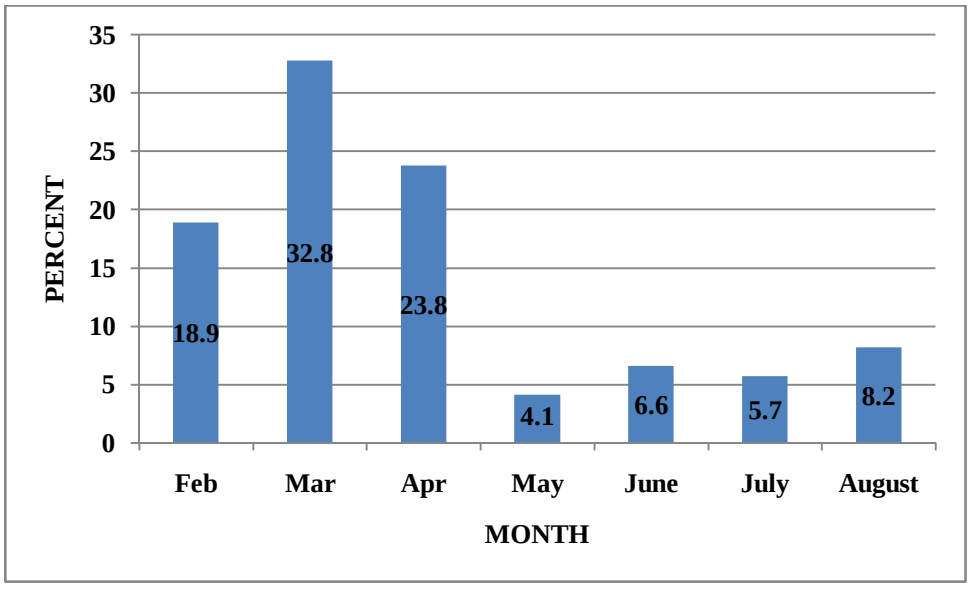


Distribution of socioeconomic status of children with measles

Month of presentation of children with measles

Month	Frequency	Percent
Feb	23	18.9
Mar	40	32.8
Apr	29	23.8
May	5	4.1
June	8	6.6
July	7	5.7
August	10	8.2
Total	122	100.0

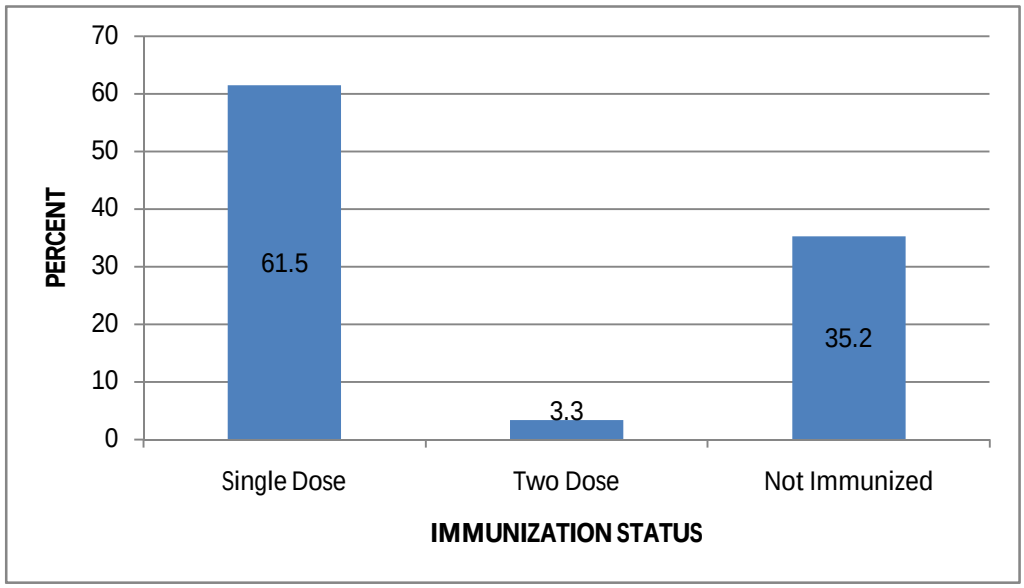
Majority of measles children were admitted during march (40 children – 32.8%) and april (29 children – 23.8%). In February 23 children with measles were admitted (18.9%). The rest of the admissions in other months were 5 children (4.1%) in may, 8 children in june (6.6%), 7 children in july (5.7%) and 10 children in august (8.2%).



Immunization status of the study population

Immunization status	Frequency	Percent
Single Dose	75	61.5
Two Dose	4	3.3
Not Immunized	43	35.2
Total	122	100.0

Unimmunized children with measles were 35.2% (43 children). 75 children with measles had 1 dose of measles vaccination (61.5%) and 4 children (3.3%) who had two doses of immunization developed measles.

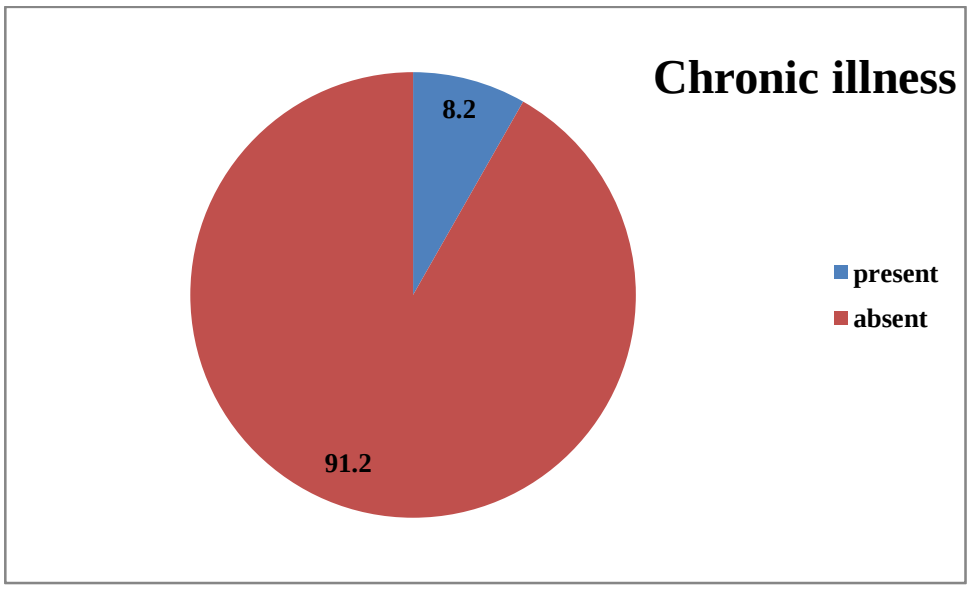


Distribution of measles immunization status of study population

Measles in children with chronic illness

Chronic illness	Frequency	Percent
present	10	8.2
absent	112	91.8
Total	122	100.0

Of the 122 children with measles, 10 children had chronic illness (8.2%). The chronic illness were seizure disorder, congenital heart disease, nephrotic syndrome and AIDS.

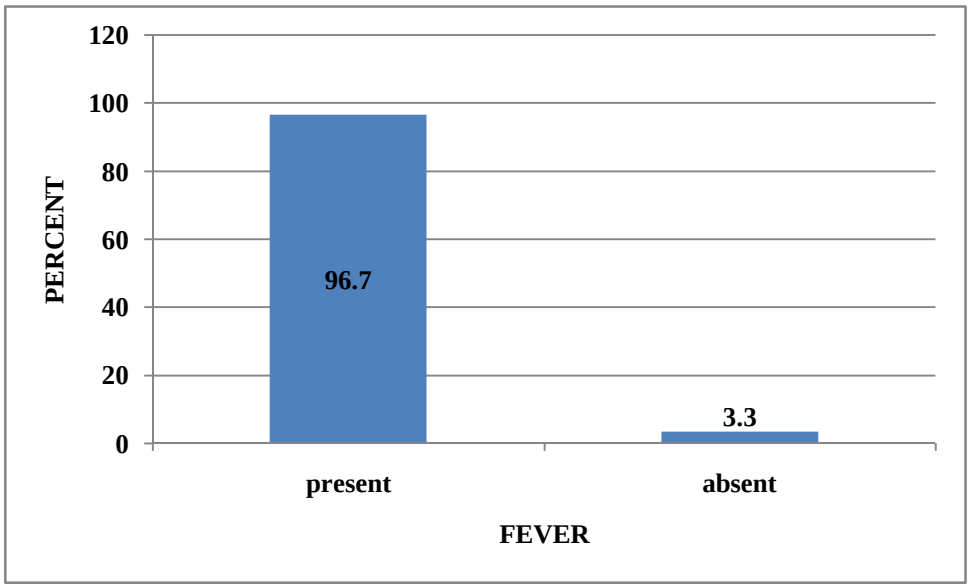


Distribution of Chronic illness in children with measles

Fever in children with measles

Fever	Frequency	Percent
present	118	96.7
absent	4	3.3
Total	122	100.0

Among the 122 children who had measles, 118 children had fever (96.7%).

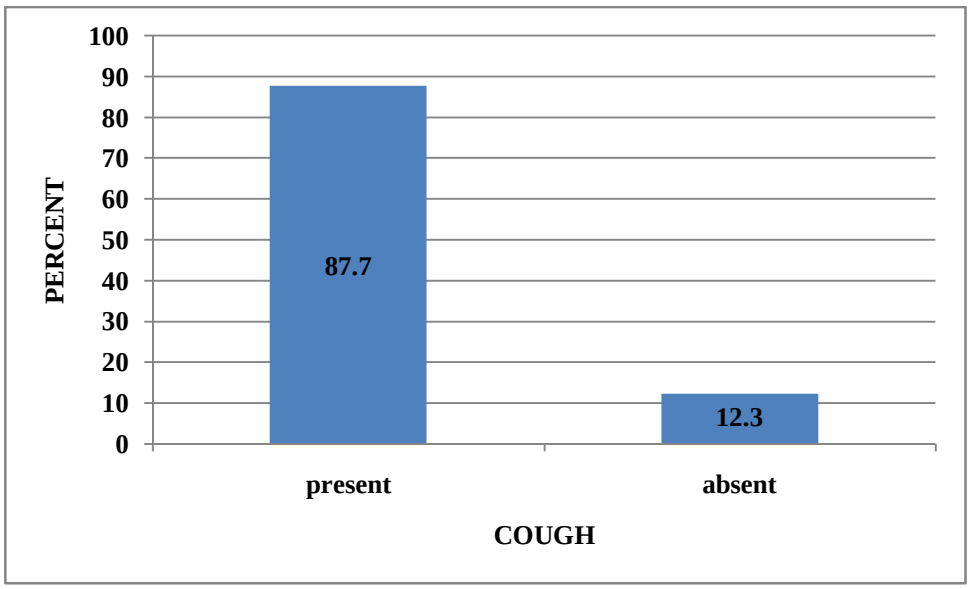


Proportion of fever in the study population

Cough in children with measles

Cough	Frequency	Percent
present	107	87.7
absent	15	12.3
Total	122	100.0

107 children (87.7%) of 122 in the study population presented with cough.

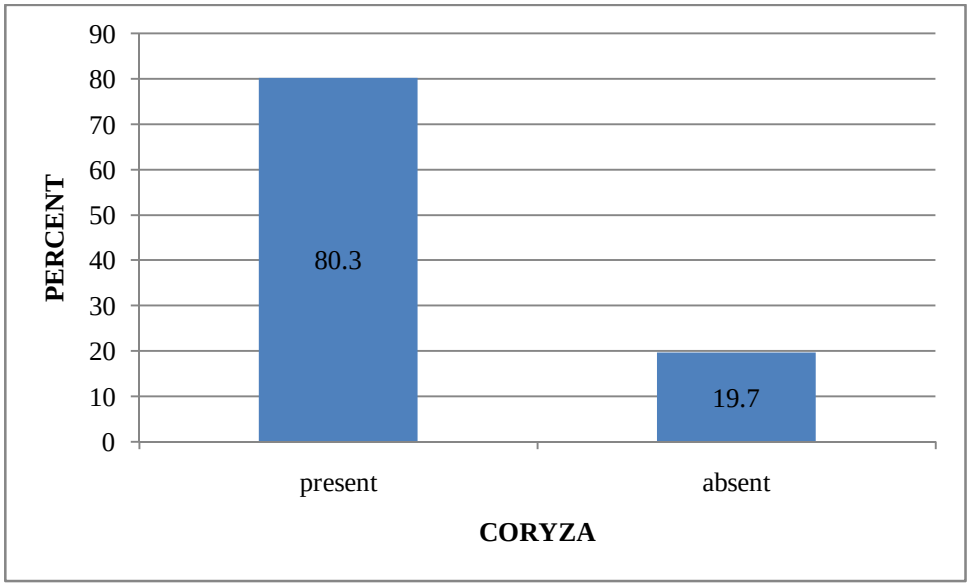


Proportion of cough in study population

Coryza in children with measles

Coryza	Frequency	Percent
present	98	80.3
absent	24	19.7
Total	122	100.0

The number children who presented with coryza as one of the symptom were 98 children (80.3%).

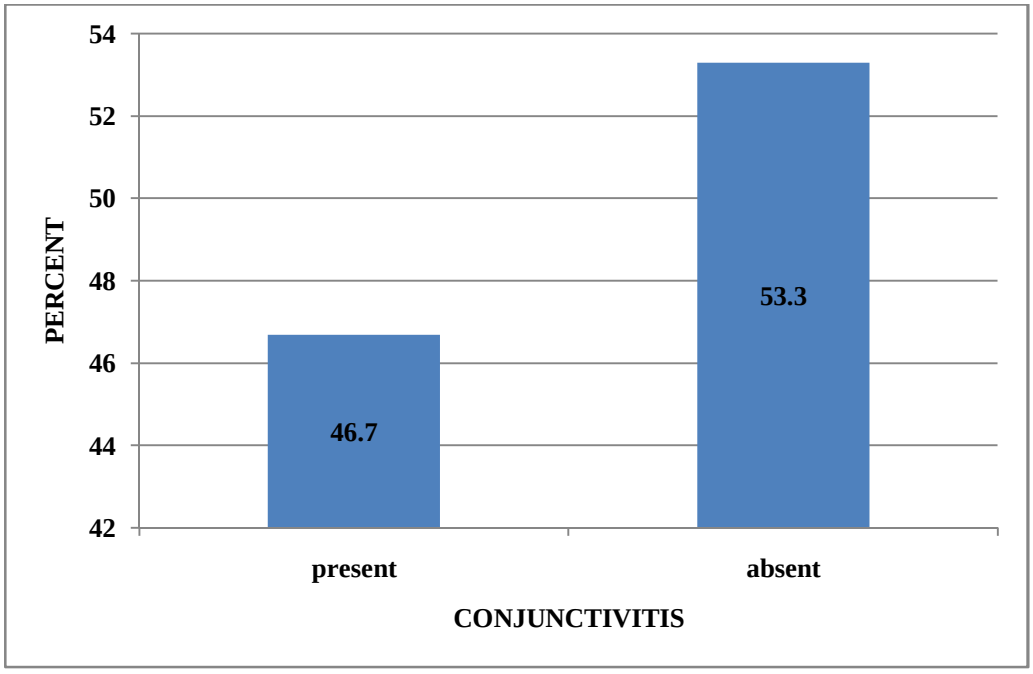


Proportion of coryza in children with measles

Conjunctivitis in children with measles

Conjunctivitis	Frequency	Percent
present	57	46.7
absent	65	53.3
Total	122	100.0

Conjunctivitis was present in 57 children (46.7%) who were admitted with measles.

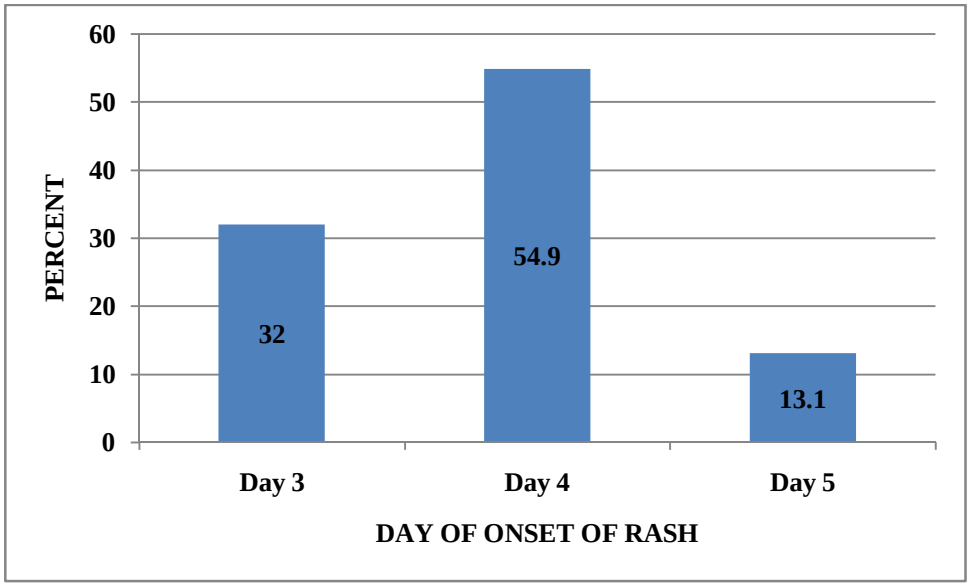


Distribution of conjunctivitis in study population

Day of onset of rash in children with measles

Day of Rash	Frequency	Percent
Day 3	39	32.0
Day 4	67	54.9
Day 5	16	13.1
Total	122	100.0

Of the 122 children with measles, rashes were present on day 3 of fever in 39 children (32%), day 4 of fever in 67 children (54.9%) and day 5 of fever in 16 children (13.1%).

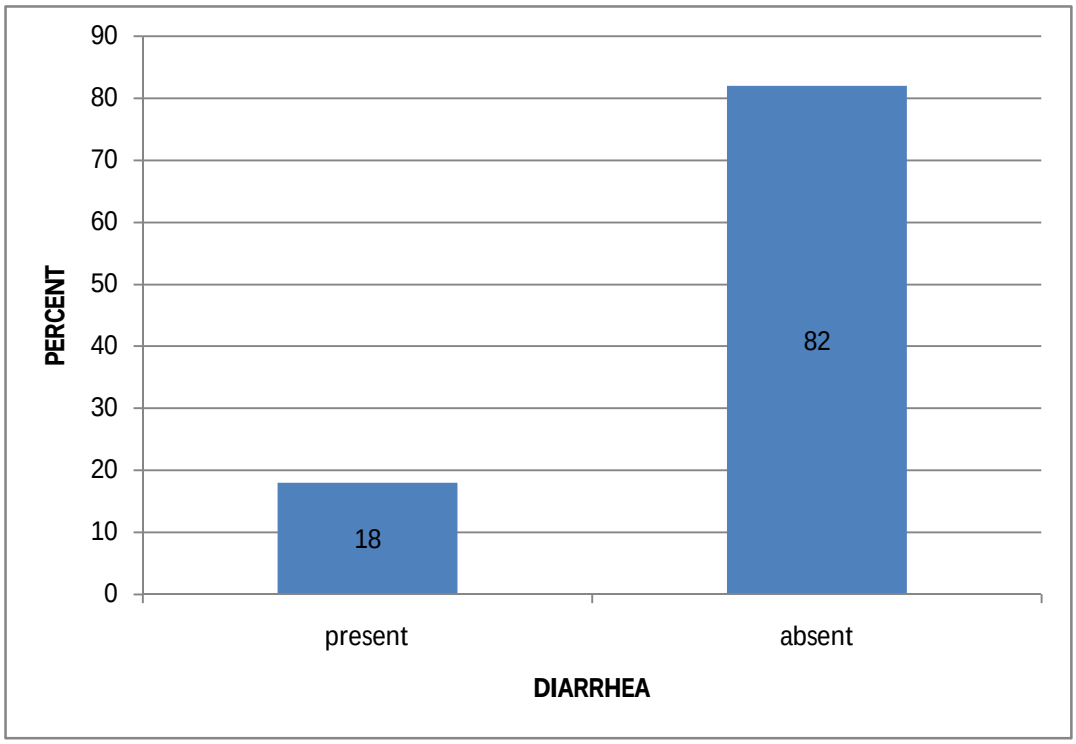


Distribution of day of onset of rash in the study population

Diarrhea in children with measles

Diarrhea	Frequency	Percent
present	22	18.0
absent	100	82.0
Total	122	100.0

22 children (18%) had complaints of diarrhea during admission out of the 122 cases of measles.

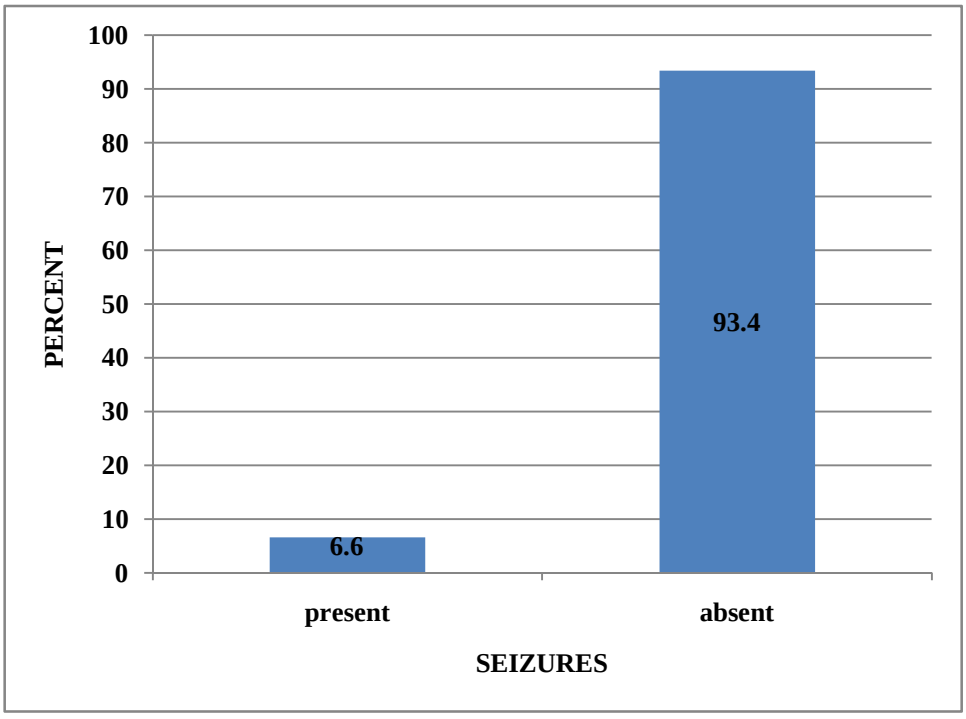


Proportion of children with diarrhea in the study group

Seizures in children with measles

Seizures	Frequency	Percent
Present	8	6.6
Absent	114	93.4
Total	122	100.0

8 children (6.6%) who were admitted for measles had seizures.

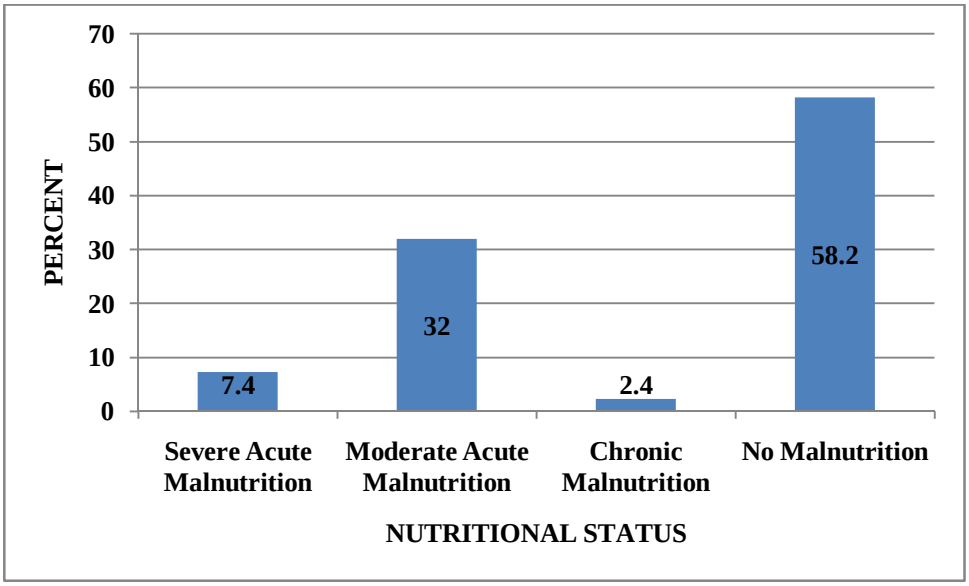


Proportion of seizures in children with measles

Nutrition status of children with measles

Nutrition	Frequency	Percent
Severe Acute malnutrition	9	7.4
Moderate Acute malnutrition	39	32.0
Chronic malnutrition	3	2.4
No malnutrition	71	58.2
Total	122	100.0

Severe acute malnutrition was present in 9 children (7.4%). 71 children (58.2%) with measles had no malnutrition. Moderate acute malnutrition was present in 39 children (32.0%) and chronic malnutrition in 3 children (2.5%).

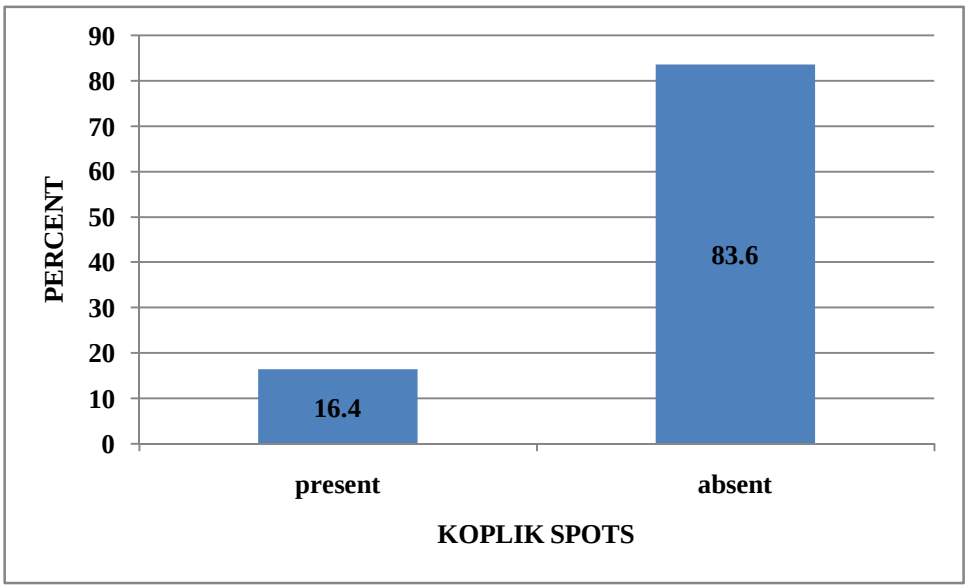


Distribution of nutritional status in children with measles

Koplik spots in children with measles

Koplik spots	Frequency	Percent
present	20	16.4
absent	102	83.6
Total	122	100.0

Koplik spots, the pathognomonic sign of measles was seen in 20 children (16.4%).

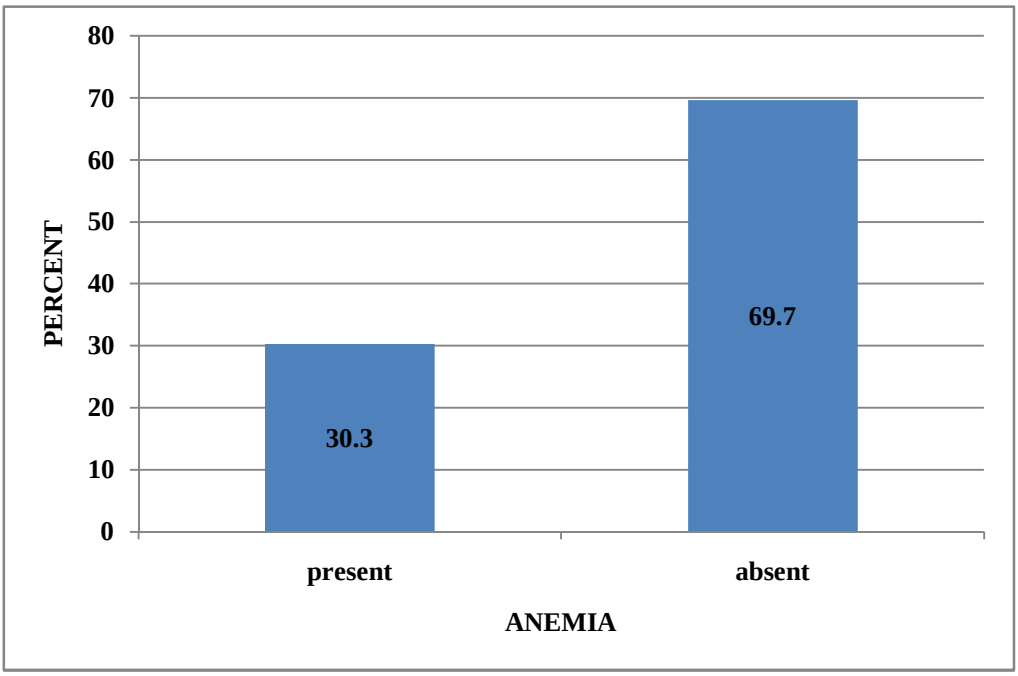


Proportion of children with koplik spots

Anemia in study population

Anemia	Frequency	Percent
present	37	30.3
absent	85	69.7
Total	122	100.0

Among the 122 children, 37 children (30.3%) had pallor.

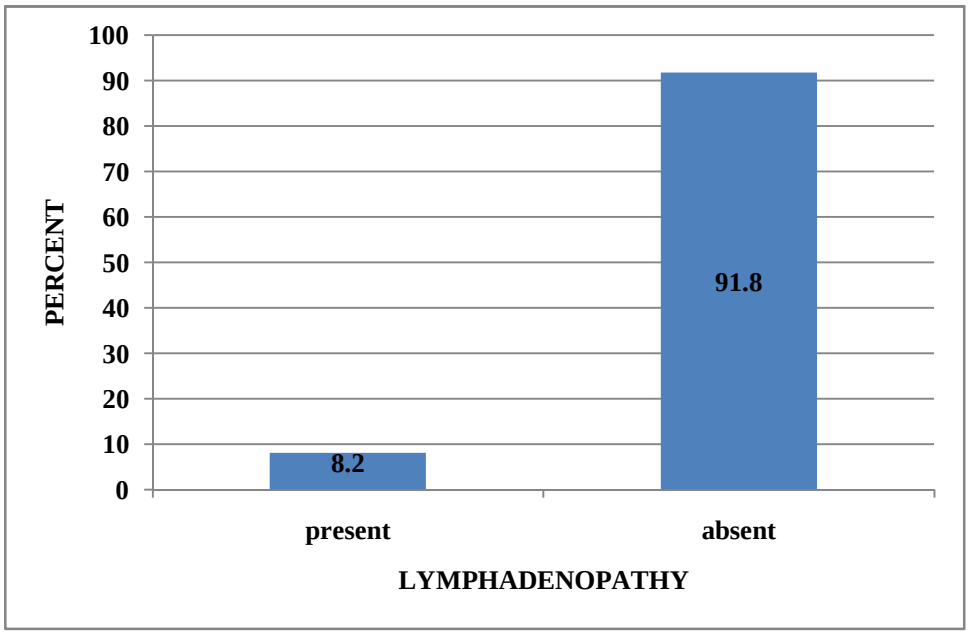


Proportion of children with anemia

Children with Lymphadenopathy in the study population

Lymphadenopathy	Frequency	Percent
Present	10	8.2
Absent	112	91.8
Total	122	100.0

10 children (8.2%) among the 122 children had lymphadenopathy may be due to secondary bacterial infection and complications.

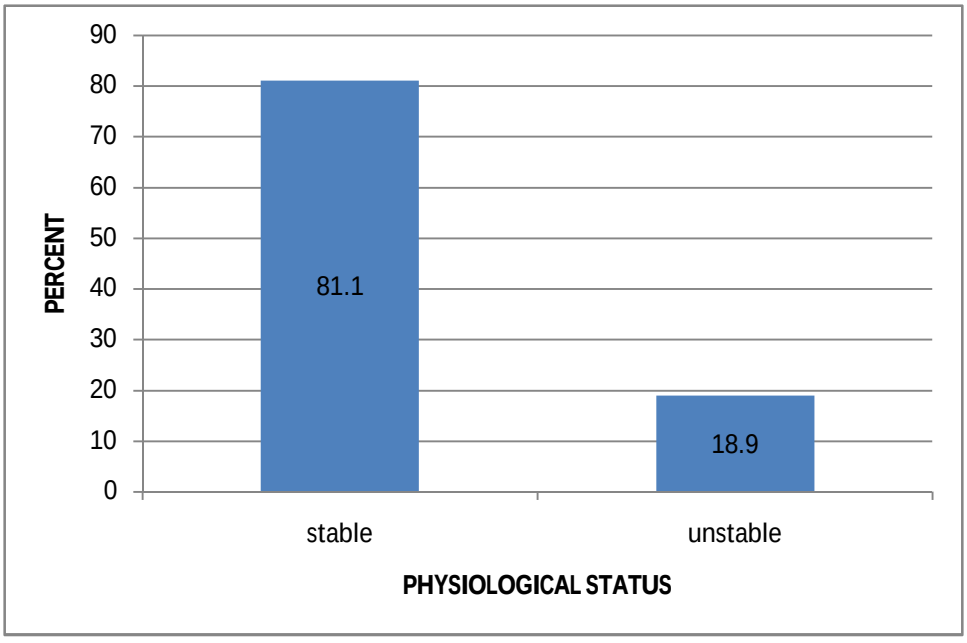


Proportion of children with lymphadenopathy

Physiological status of children in study group

Physiological status	Frequency	Percent
Stable	99	81.1
Unstable	23	18.9
Total	122	100.0

Among the 122 children, 99 children (81.1%) had a normal physiological status and the 23 children (18.9%) had unstable physiological status in the form of respiratory distress and shock.

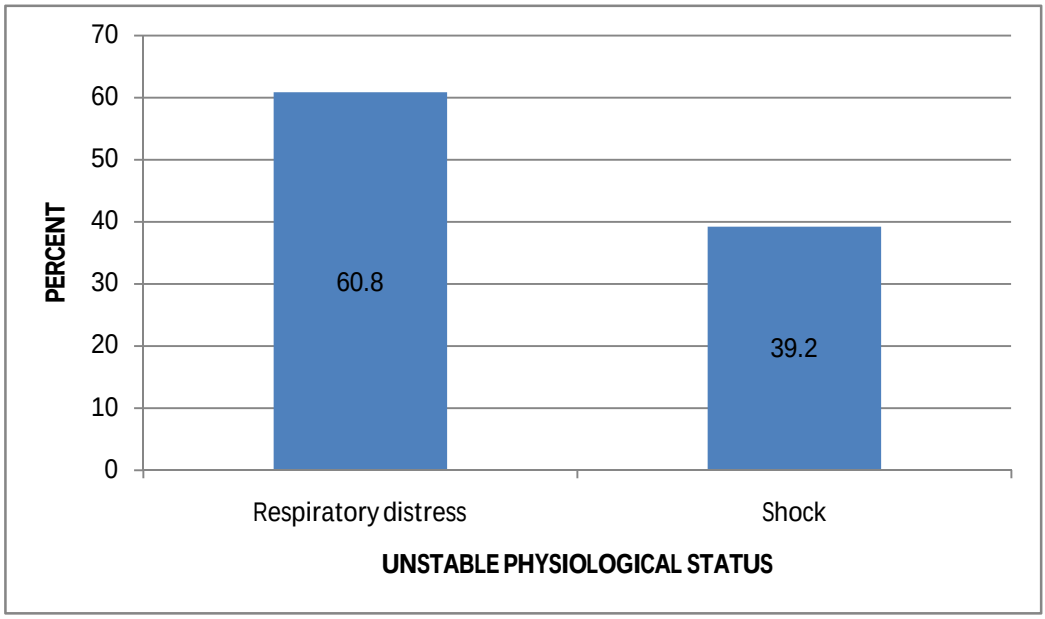


Children with unstable physiological status

Children with unstable physiological status

Unstable physiological status	Frequency	Percent
Respiratory distress	14	60.8
Shock	9	39.2
Total	23	100

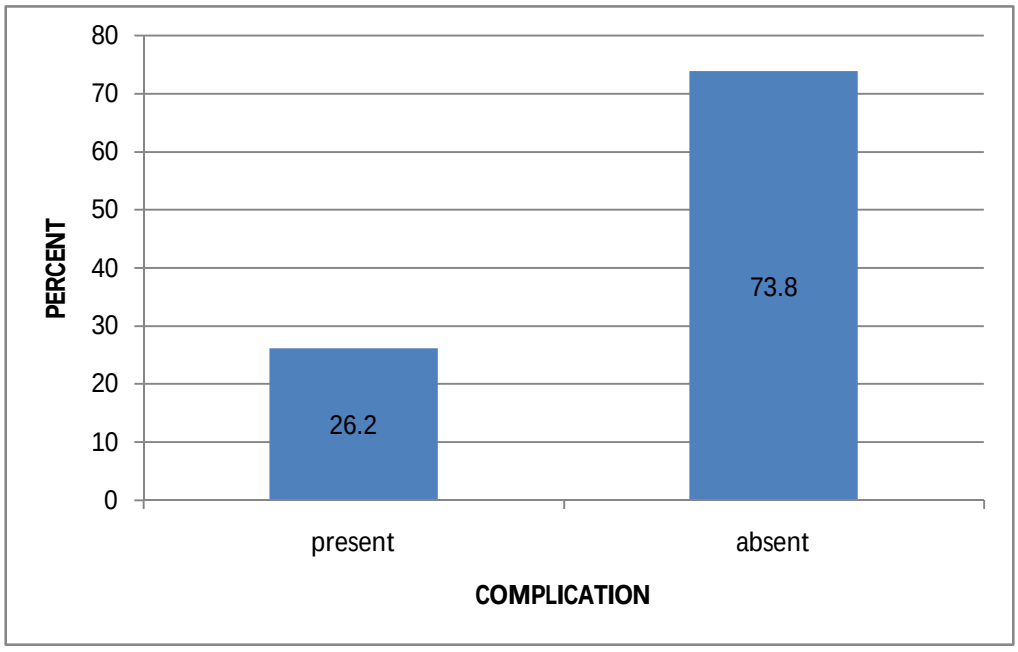
Among the 23 children who had unstable physiological status 14 children (60.8%) had respiratory distress due to pneumonia while 9 children (39.2%) had shock as a result of various complications.



Complications in children with measles

Complications	Frequency	Percent
present	32	26.2
absent	90	73.8
Total	122	100.0

Among the 122 children, 32 children (26.2%) developed complications in the form of pneumonia, diarrhea, febrile seizures and encephalopathy. 90 children (73.8%) had and uneventful course of measles.

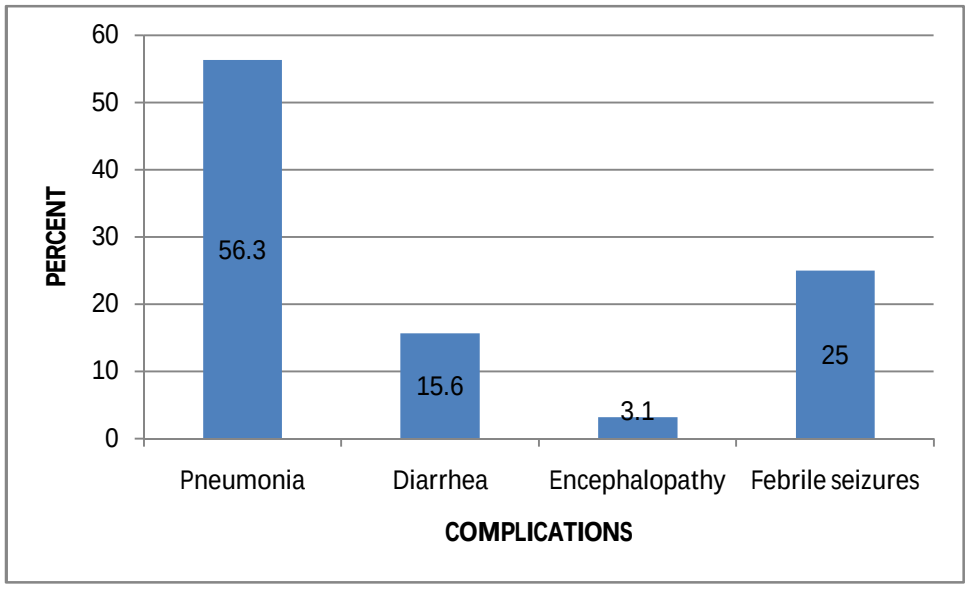


Proportion of children with complications

Proportion of various complications in measles children

Complications	Frequency	Percent
Pneumonia	18	56.3
Diarrhea	5	15.6
Encephalopathy	1	3.1
Febrile seizures	8	25
Total	32	100

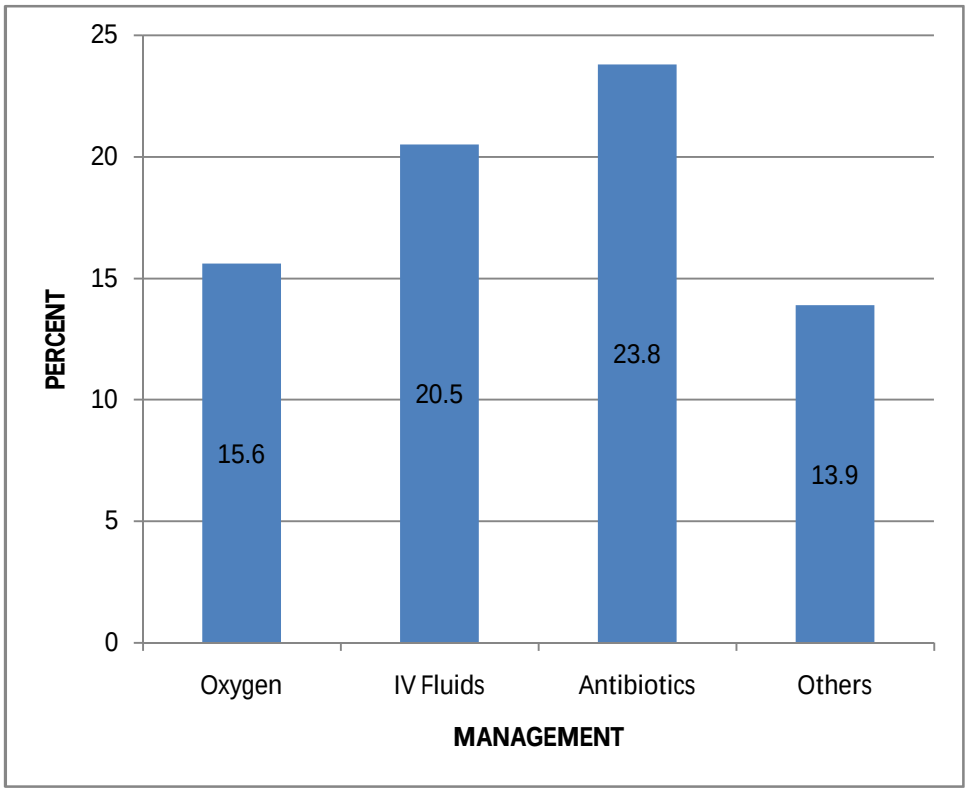
Among the children who developed complication, majority developed Pneumonia (18 children – 56.3%). 8 children(25%) had febrile seizures. Diarrhea was present in 5 children (15.6%) and one child developed encephalopathy.



Management required for children with measles

Management	Frequency	Percent
Oxygen	19	15.6
IV Fluids	25	20.5
Antibiotics	29	23.8
Others	17	13.9

19 children (15.6%) pneumonia required treatment with oxygen, 20.5% with shock and dehydration received IV fluids, 23.8% were treated with antibiotics for shock and febrile convulsions and 13.9% required other management like anti epileptic drugs and zinc.



Length of stay in study population

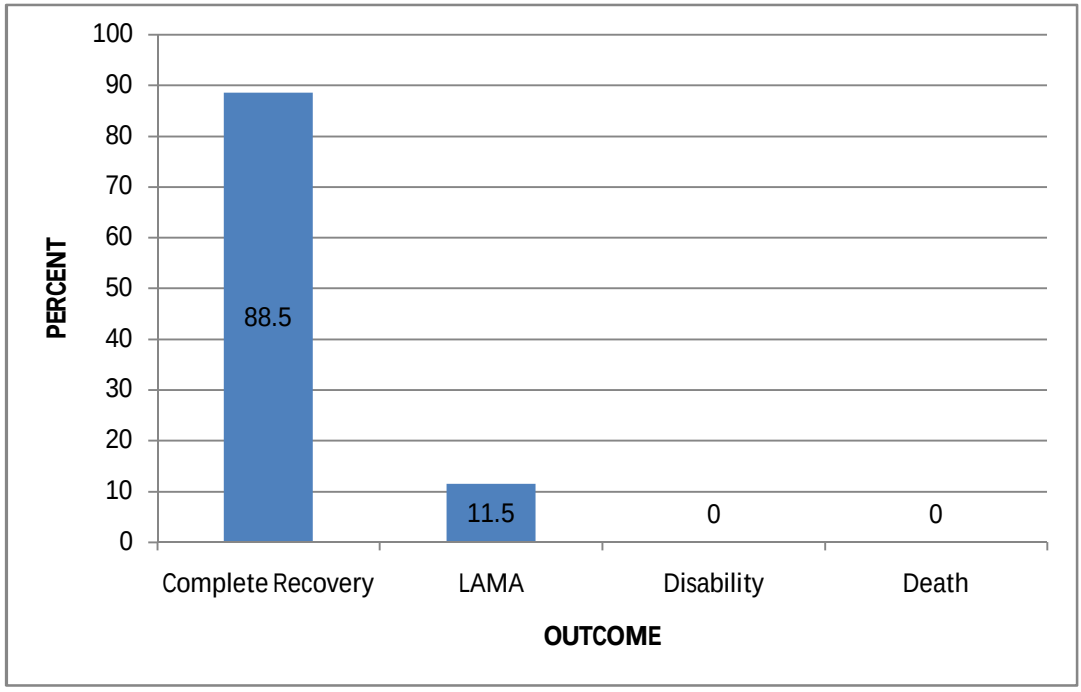
	N	Minimum	Maximum	Mean	Std. Deviation
Length of Stay	122	2	11	5.04	1.783

The mean length of hospital stay of 122 children was 5.04 days. The minimum duration of stay was 2 days and maximum was 11 days.

Outcome of children admitted with measles

Outcome	Frequency	Percent
Complete Recovery	108	88.5
LAMA	14	11.5
Total	122	100.0

Of the 122 children, 108 children (88.5%) completely recovered. 14 children (11.5%) went against medical advice. No death occurred during the study period due to measles and its complications.

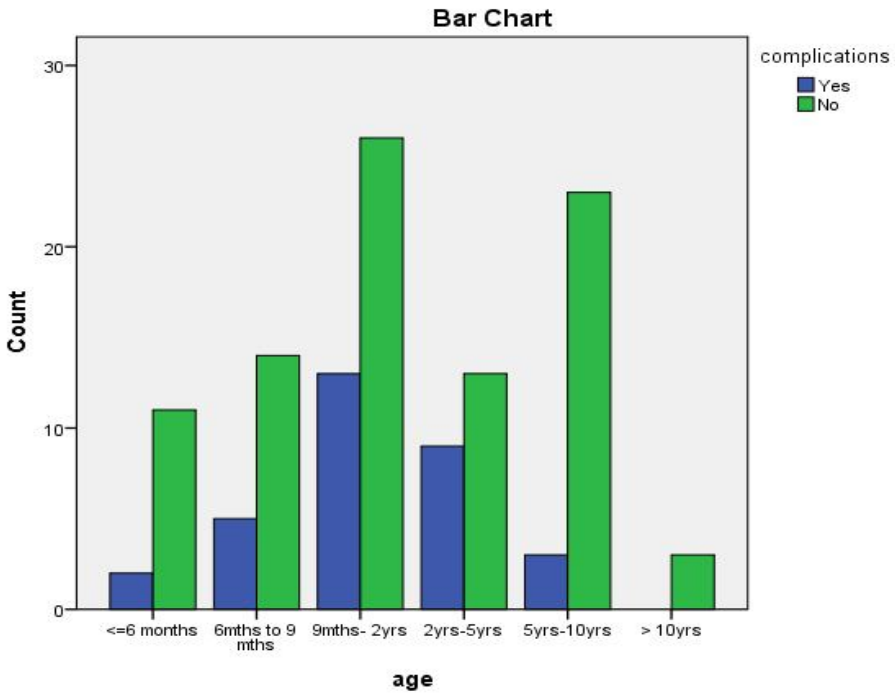


Crosstabulation of Age of children and complications

Age	complications		Total
	Yes	No	
<=6 months	2	11	13
6mths to 9 mths	5	14	19
9mths- 2yrs	13	26	39
2yrs-5yrs	9	13	22
5yrs-10yrs	3	23	26
> 10yrs	0	3	3
Total	32	90	122

P value 0.144

Of the 32 children who developed complications 13 children were between 9 months and 2 years. 7 children < 9 months developed complications.



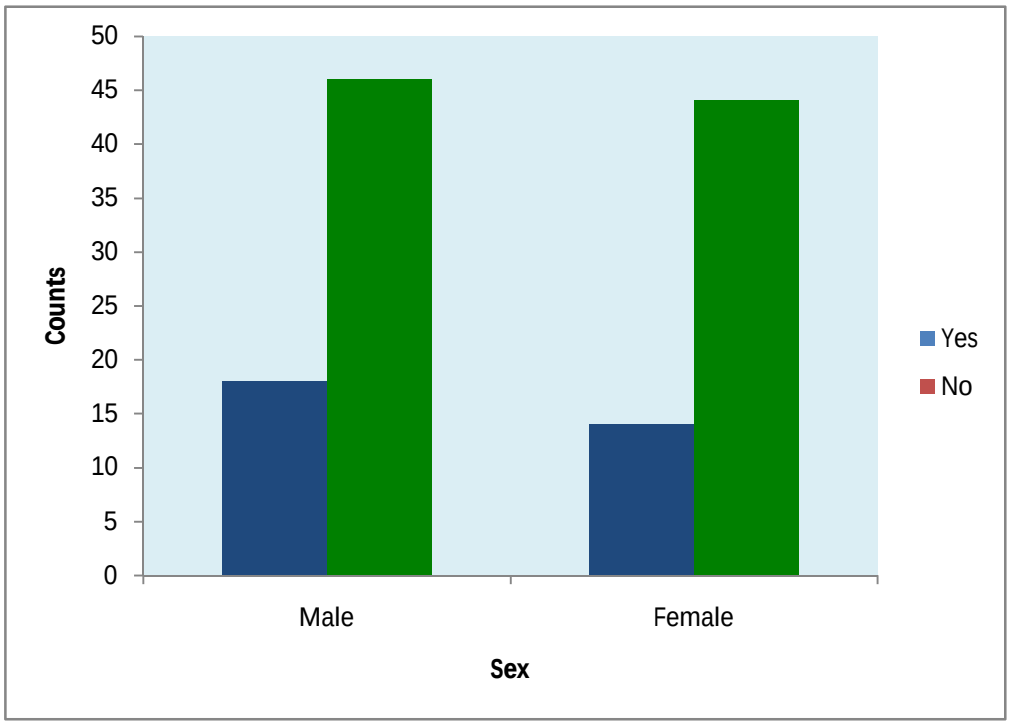
Cross tabulation of sex of children and complications

Sex	complications		Total
	Yes	No	
Male	18	46	64
Female	14	44	58
Total	32	90	122

P value 0.717

Of the 64 male children admitted with measles, 18 developed complications.

Among female children 14 developed complications out of 58 children.

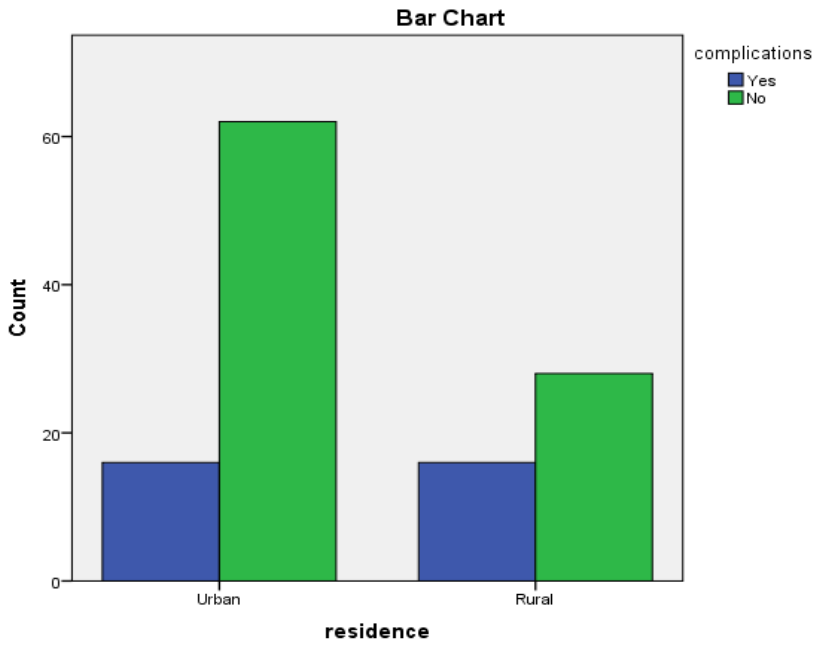


Crosstabulation of residence of children and complications

Residence	complications		Total
	Yes	No	
Urban	16	62	78
Rural	16	28	44
Total	32	90	122

P value 0.056

Children with place of residence in urban area had complication in 16 children 78 children and 16 children from rural residence developed complications among 44 children.

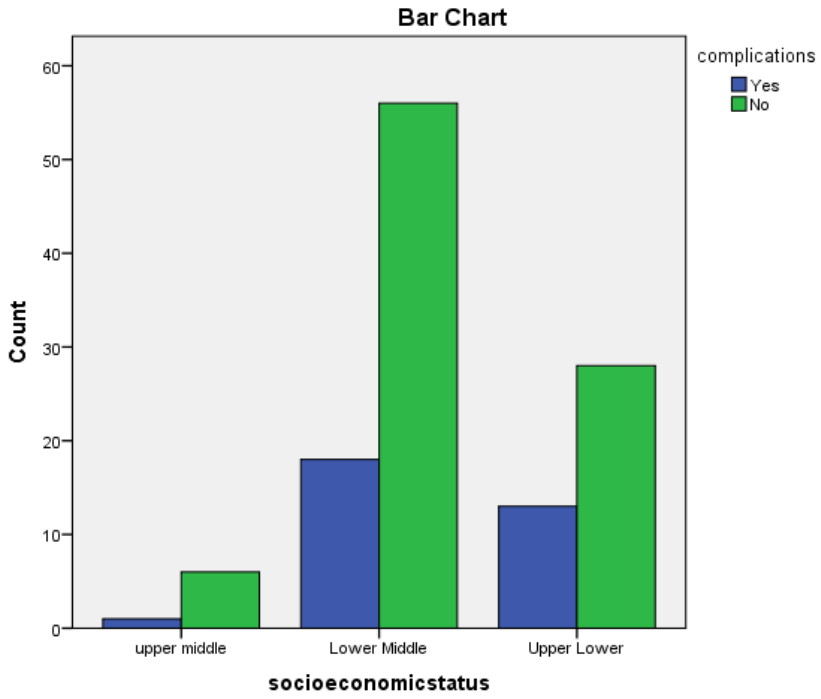


Crosstabulation of socioeconomic status of children and complications

Socioeconomic status	complications		Total
	Yes	No	
Upper	0	0	0
Upper Middle	1	6	7
Lower Middle	18	56	74
Upper Lower	13	28	41
Lower	0	0	0
Total	32	90	122

P value 0.524

18 children from lower middle class had complications. In upper lower class 13 developed complications of 28 children and 1 had complications from upper middle class.

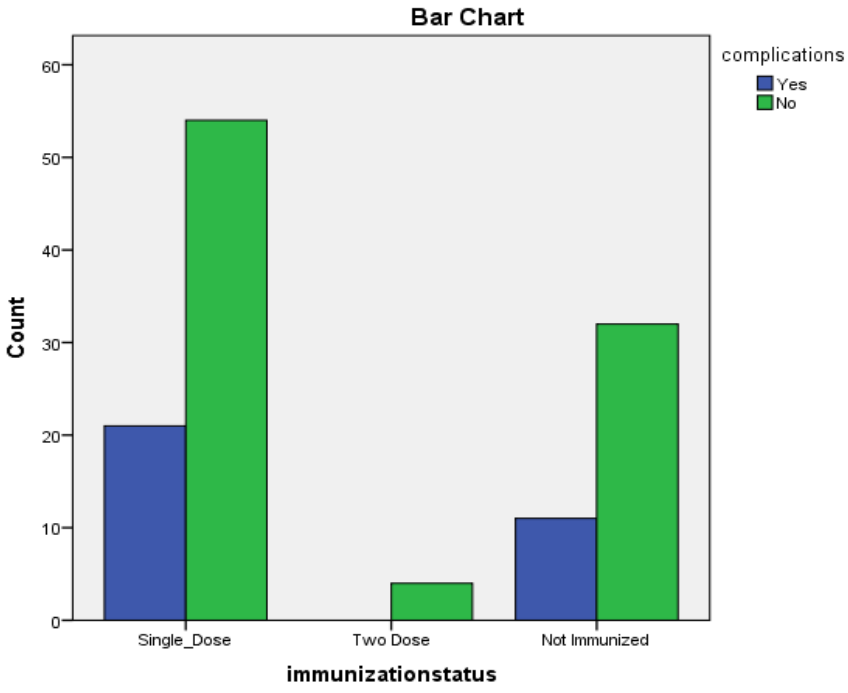


Crosstabulation of immunization status and complications

Immunization status	complications		Total
	Yes	No	
Single Dose	21	54	75
Two Dose	0	4	4
Not Immunized	11	32	43
Total	32	90	122

P value 0.460

21 children out of 75 children with single dose of measles vaccination developed measles whereas in unimmunized group 11 of 43 children developed complications. No complications were seen in 4 children who were immunized with two doses of measles vaccination.

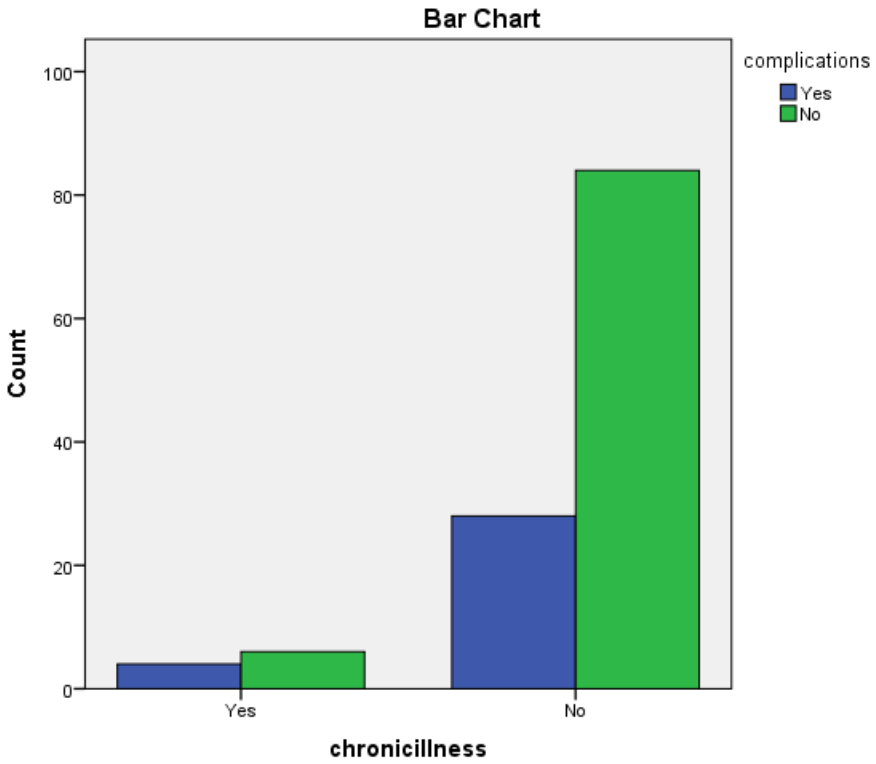


Crosstabulation of chronic illness and complications

Chronic illness	complications		Total
	Yes	No	
Yes	4	6	10
No	28	84	112
Total	32	90	122

P value 0.302

10 children with chronic illness like seizure disorder, congenital heart disease, nephrotic syndrome and AIDS had measles. 4 among them developed complications.

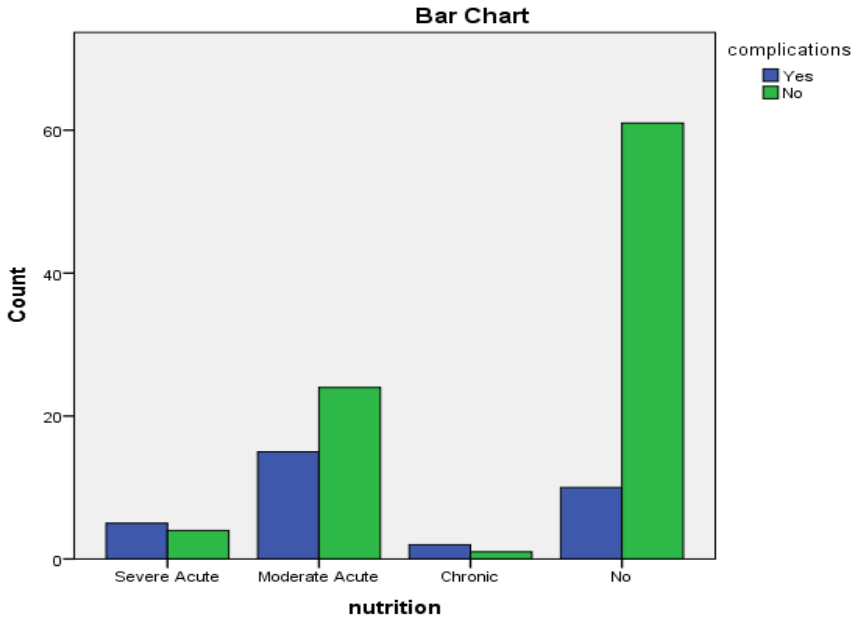


Crosstabulation of Nutritional status of children and complications

Nutrition	complications		Total
	Yes	No	
Severe Acute malnutrition	5	4	9
Moderate Acute malnutrition	15	24	39
Chronic malnutrition	2	1	3
No	10	61	71
Total	32	90	122

P value 0.002

Among the 122 children with measles, 51 children had malnutrition and complications were higher in children with co existing malnutrition. The p value was statistically significant (p value 0.002).



Association of complications and length of hospital stay

	complications	N	Mean	Std. Deviation	Std. Error Mean
LOS	Yes	32	7.28	1.550	.274
	No	90	4.24	1.020	.108

Children who had complications (32 children) had a longer duration of hospital stay with mean of 7.28 days. Children without measles had a mean hospital stay of 4.24 days with a standard deviation of 1.020.

DISCUSSION

Measles is the most common vaccine preventable disease world wide. In developing countries measles still contributes significantly to morbidity and mortality in children. In India, measles accounts for 5% of under 5 mortality and contributes to 47% of global measles death[7,11]. The main problem our country is facing in eliminating the disease is changing epidemiologic pattern, poor immunization coverage and need for catch up immunization. Only 71% of children in our country receive vaccination between 9 months to 12 months

Changing epidemiologic trends has led to more children getting measles less than 1 year of age as a result of low protective maternal measles antibody titre in children as said by Baba Usman Ahmadu et al[17]. In studies done previously on measles, the diagnosis of measles is made clinically like children presenting with maculopapular rash, cough, conjunctivitis, coryza and koplik spots. In our study, children diagnosed clinically as measles are confirmed by laboratory diagnosis namely Ig M measles antibody.

122 children were included in the study. Age of the children with measles in our study ranged from 4 months to 12 years. 26.7% of children were less than 9 months of age, the age at which first dose of measles vaccination is given in our country. Among them 10.7% of children were less than 6 months of age, where maternal measles antibodies is said to be protective against measles. Majority of the children were between 9 months and 2 years (32%).

COMPARISON OF AGE GROUP OF MEASLES IN DIFFERENT STUDIES

AGE GROUP	Our Study	Raote et al[15]	Ariyasriwatana C et al[14]	Alphonsus N et al[12]	Anis-ur-Rehman et al[13]
< 9 months	26.7%	28% (<1 year)	23.9%	18.1%	20.5% (<1 year)
9 mths to 2 years	32%	60% (1 to 2 years)	35.1%	81.9%	41.9% (1 – 5 years
2 to 5 years	18%	8.6%	41%		
>5 years	23.8%	2.6%			37.4%

In developing countries, one fourth of children are acquiring measles before the age of vaccination. The age distribution was similar to the study done by Ariyasriwtanaet al[14] in Thailand, but proportion of children < 6 months with measles is not documented in the study.

In our study, the male to female ratio of measles was 1.10:1. 52.4% of male children and 47.6% of female children developed the disease. There was a slight male preponderance which was similar to other studies done on measles.

COMPARISON OF SEX DISTRIBUTION OF MEASLES IN STUDIES

SEX DISTRIBTUION	Our study	Raote et al[15]	Ariyasriwatana C et al[14]	Alphonsus N et al[12]	Aurangazeb et al[16]	Anis-ur-Rehman et al[13]
Male:Female	1.10:1	1.2:1	1.56:1	1.03:1	1.59:1	1.5:1

63.9% of children with measles were from urban area. 36.1% were from rural area. Overcrowding, migration and easy accessibility to health care may have contributed to higher proportion of cases from urban areas. The result was similar to study done by Alphonsuset al[12] where 67.5% of children were from urban areas. Majority of the children were from lower middle class (60.7%) while the remaining belong to upper lower (33.6%) and upper middle class (5.7%).

The study was done over a period of seven months from February 2015 to August 2015. March month had the most number of cases (32.8%). 75.5% of cases were between the month of February and April. This was similar to the study done by Alphonsus C et al[12] where 80.5% of measles cases occurred during the dry season.

35.2% of children with measles were unimmunized. 72 children who presented with measles had a single dose of immunization which may be due to poor seroconversion rate of measles vaccine when administered at 9 months. 4 children with measles had 2 doses of immunization.

10 children with chronic illness like seizure disorder, congenital heart disease, nephrotic syndrome and retroviral disease developed measles which

contributed to 8.2% of measles cases. In the study by Ariyasriwatana C et al[14] in Thailand, 9% of children had underlying diseases.

SYMPTOM ANALYSIS

SYMPTOM	FREQUENCY	PERCENTAGE
Fever	118	96.7%
Cough	107	87.7%
Coryza	98	80.3%
Conjunctivitis	57	46.7%
Day of onset of rash ➢ Day 3 ➢ Day 4 ➢ Day 5	 39 67 16	 32% 54.9% 13.1%
Diarrhea	22	18%
Seizures	8	6.6%

The common presentations of children with measles from above tabulation are fever (96.7%), cough (87.7%), coryza (80.3%) and conjunctivitis (46.7%). Majority of children developed rashes on day 4 of onset of fever (54.9%) while the rest developed on day 3(32%) and day 5 (13.1%). Diarrhea and seizures were present in 22 (18%) and 8 (6.6%) children respectively. In the study done by Ariyasriwatana C et al[14] rash, cough and coryza was found in 92.3% of cases similar to our study.

Malnutrition was present in 41.8% of children with measles. 7.4% had severe acute malnutrition, 32% had moderate acute malnutrition and 2.4% had

chronic malnutrition. The percentage of children with malnutrition in our study is less when compared to other studies (Raote et al[15], Aurangazeb et al[16] and Anis-ur-Rehman et al[13])

COMPARISON OF MALNUTRITION IN MEASLES AMONG STUDY GROUPS

NUTRITIONAL STATUS	Our study	Raote et al[15]	Aurangazeb B et al[16]	Ariyasriwatana C et al[14]	Anis-ur-Rehman et al[13]
Malnutrition ➢ Mild ➢ Moderate ➢ Severe ➢ Chronic	 32% 7.4% 2.4%	 36.6% 9.9%	71.2%	 12.4% 4.8% 2.1%	 7.3% 23.5% 40.4%
No Malnutrition	58.2%	53.3%	28.8%	66%	28.6%

Malnourished children had higher incidence of complication when compared to well nourished children which is statistically significant (p value 0.002)

20 children (16.4%) in the study population had koplik spots. This observation is higher when compared to study done by Anis-ur-Rehmanet al[13] (10%). 30.3% children had anemia and 8.2% had lymphadenopathy. Among the 122 children, 23 presented with unstable physiological status like respiratory distress and shock due to complications like pneumonia, diarrhea and acute CNS infection.

26.2% of children admitted with measles developed complications in our study which was contributed by pneumonia (56.3%), diarrhea (15.6%), febrile seizures (25%) and encephalopathy (3.1%). The proportion of children

with complications were nearly half when compared to the study done by Raoteet al[15] in India during the initial years of introduction of measles vaccine.

COMPLICATIONS OF MEASLES AMONG VARIOUS STUDIES

COMPLICATIONS	Our study	Raote et al[15]	Anis-ur-Rehman et al[13]	Alphonsus N et al[12]	Aurangazeb B et al[15]	Ariyasriwatana C et al[14]
Pneumonia	56.3%	43%	39.7%	55.1%	40%	62.2%
Diarrhoea	15.6%	14.6%	37.5%	13%	38.5%	38.1%
Febrile convulsions	25%	2.6%		5.8%		
Encephalitis	3.1%	8%	8.8%			

Pneumonia (56.3%) was the most common complication in our study which was similar compared to other studies. But incidence of diarrhea (15.6%) was lower when compared to previous studies. 25% of children developed febrile seizures and it was the second most common complication following measles. Only one child had encephalopathy.

The mean length of stay of children admitted with measles was 5 days ranging from 2 to 11 days. Children with complications and malnutrition had a longer length of hospital stay when compared to other children similar to the study done by Anis-ur-Rehmanet al[13].

Of the 122 children, 108 children completely recovered (88.5%) while 14 children left against medical advice whose final outcome could not be ascertained. There was no death among the children admitted with measles, the reason may be increased health care facilities and low incidence of children developing encephalitis compared to previous studies.

CONCLUSION

Measles is the most common vaccine preventable disease presenting to our hospital. Even after introduction of two doses of measles vaccination, there is no decline in measles admission in our hospital with an average of 200 children admitted each year. There is a shift in epidemiology of measles with more amount of children affected less than the immunization age (9 months). In our study 26.3% of children with measles were less than 9 months of age. This may be attributable to poor maternal measles antibody levels in the children. 58.3% of children were less than 2 years and complications are higher in young children.

Measles vaccination when given at 6 months has a seroconversion rate of 76%. When given a vaccination at 6 months, children with low maternal measles antibodies may be protected till the next vaccination at 9 months. The incidence of measles in children between 6 to 9 months may be decreased which requires further studies.

Male and females are almost equally acquired measles. Higher admissions are from urban areas. Higher proportion of cases were children with single dose of measles vaccination may be due to poor seroconversion at 9 months. Majority of cases occurred during the months of February, March and April.

Malnutrition was present in 41.8% children and was associated with higher rates of complications which was statistically significant (p 0.002) and longer length of stay in hospital. Pneumonia was the most complication

(56.3%). Second most complication was febrile seizures contributing to 25% followed by diarrhea (15.6%). The average length of stay in hospital was 5 days. All the children had complete recovery. There was no mortality in the study population. The overall outcome of study population was good.

LIMITATIONS

The study was done in children's hospital, Egmore. Only children who presented to this hospital were studied. Children presenting to other peripheral hospitals in the same demographic area were not studied. The study was done for 7 months from February to August. The occurrence of disease over a period of 1 year could not be analysed.

Children from rural areas could have been treated at peripheral health centres. Source of infection of children with measles was not analysed. The final outcome of some children who went against medical advice could not be ascertained. Since the study group represented only few areas of the region, the results could be generalized to whole population.

BIBLIOGRAPHY

1. Mason WJ. Measles. Kliegman RM, Stanton BF, Geme JW, Schor NF, Behrman RE. Nelson Textbook of Pediatrics. 19th ed. Philadelphia:Elsevier;2011.pp 1069-1075.
2. Park K. Textbook of preventive and social medicine. 22nd ed. Jabalpur:Bhanot;2013.pp 138-141.
3. WHO Fact Sheet No.286 . 2006. Available from http://www.who.int/mediacentre/factsheets/fs286/en/
4. WHO (2012), Weekly Epidemiological Record, No.5, 2012
5. WHO. Global Measles and Rubella. Strategic Plan 2012-2020. Available from http://www.who.int/immunization/newsroom/Measles_Rubella_StrategicPlan_2012_2020.pdf.
6. John TJ, Choudhury P. Acclerating Measles Control in India: Opportunity and Obligation to Act Now. Indian Pediatr2009;46:939-943.
7. Choudury P, Vani S. Measles, mumps and rubella vaccines. Bansal CP, Vashishtha VM, yewale VN, Agarwal R. IAP Guidebook on Immunization 2013-2014.Mumbai;2014
8. Stein EC, Brimingham M, kurian M, Duclos P, Strebel P. The global burden of measles in the year 2000:a model that uses country-specific indicators.J Infect Dis 2003;87(Suppl 1):S8-S14
9. Aaby P, Garly ML, Bale C, Martin C, Jensen H, Whittle H. Survival of previously measles vaccinated and measles unvaccinated children

in emergency situation, an un-planned study.Pediatr Infec Dis J 2003;22:798-805.

10. Panicker CKJ. Textbook of microbiology. 8th ed. India:University press;2009.pp 517-520.
11. Sinha K. Times of India report:47% of global measles deaths in india.2012. Apr 24 Available from http://articles.timesofindia.indiatimes.com/2012-04-24/science/31392204_1_measles-vaccine-secod-dose-measles-mortality.
12. Alphonsus N. Onyiriuka. Clinical profile of children presenting with measles in a Nigerian secondary health-care institutuion.J. Infect. Dis. 2011 jun;3(6):112-116.
13. Anis-ur-Rehman, Tahir Saeed Siddiqui, Muhammad Idris. Clinical outcome in measles patients hospitalized with complications.J Ayub Med Coll Abbottabad 2008;20(2)
14. Ariyasriwatana C, Kalayanarooj S. Severity of measles: a study at the Queen Sirikit National Institute of Child Health. J Med Assoc Thai. 2004 Jun;87(6):581-8.
15. Raote GJ, Bhave SY. Clinical profile of measles – a prospective study of 150 hospital based children. Indian Pediatr. 1992 Jan;29(1):45-8.
16. Aurangazeb B, Nisar YB, Hazir T, Burki F, Hassan M. Clinical outcome in children hospitalized with complicated measles.J Coll Physicians Surg Pak. 2005 Sep;15(9):547-51.

17. Ahmadu BU, Mava Y, Ambe JP, Abdallah JA, Ovansa EO. Predicting changing measles epidemiology in an urban West African population.Ann Trop Med Public Health 2013;6:179-182
18. Jin D, Ding J, Sun J, Tong W. Analysis of serious respiratory complications in PICU in children with measles.Zhonghua Er Ke Za Zhi. 2015 Feb;53(2):124-8.
19. Abramson O, Dagan R, Tal A, Sofer S. Severe complications of measles requiring intensive care in infants and young children.Arch Pediatr Adolesc Med. 1995 Nov;149(11):1237-40.
20. Sinha DP. Measles and malnutrition in a West Bengal village.Trop Geogr Med. 1977 Jun;29(2):125-34.
21. Alwar AJ. The effect of protein energy malnutrition on morbidity and mortality due to measles at Kenyatta National Hospital, Nairobi (Kenya).East Afr Med J. 1992 Aug;69(8):415-8.
22. Olatian AE, Ella EE, Ameh JB. Comparative seroprevalence of measles virus immunoglobulin M antibodies in children aged 0-8 months and a control population aged 9-23 months presenting with measles-like symptoms in selected hospitals in Kaduna State.Int J Gen Med. 2015 Mar;9:101-8.
23. Aaby P, Martins CL, Garly ML, Andersen A, Fisker AB, Claesson MH et al. Measles vaccination in the presence or absence of maternal measles antibody: impact on child survival.Clin Infect Dis. 2014 Aug 15;59(4):484-92.

24. Ariyasriwatana C, Kalayanarooj S, Pattamadilok S. Antibody response after measles immunization.J Med Assoc Thai. 2003 Aug;86 Suppl 3:S701-6.
25. Johnson CE, Nalin DR, Chui LW, Whitwell J, Marusyk RG, Kumar ML. Measles vaccine immunogenicity in 6-versus 15-month-old infants born to mothers in the measles vaccine era.Pediatrics. 1994 Jun;93(6 Pt 1):939-44.

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr.Bharanikumar.R.
Postgraduate in M.D.(Paediatrics)
Madras Medical College
Chennai – 600 003.

Dear Dr. Bharanikumar.R.,

The Institutional Ethics Committee has considered your request and approved your study titled **"Trends in Epidemiology , Morbidity Pattern and Outcome of Children with Measles in a Tertiary Care Centre in South India" No.58012015.**

The following members of Ethics Committee were present in the meeting held on 20.01.2015 conducted at Madras Medical College, Chennai-3.

1. Dr.C.Rajendran, M.D.,	: Chairperson
2. Dr.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3. Prof.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4. Prof.R.Nandini, M.D., Inst.of Pharmacology, MMC	: Member
5. Prof.P.Ragumani, M.S., Professor, Inst.of Surgery, MMC	: Member
6. Prof.Md.Ali, M.D., D.M., Prof. & HOD of Medl.G.E., MMC	: Member
7. Prof.K.Ramadevi, Director , Inst.of Biochemistry, MMC	: Member
8. Prof.Saraswathy, M.D., Director, Pathology, MMC, Ch-3	: Member
9. Prof.S.G.Sivachidambaram, M.D., Director i/c, Inst.of Internal Medicine, MMC	: Member
10.Thiru S.Rameshkumar, Administrative Officer	: Lay Person
11.Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
12.Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

22/1/15

Member Secretary, Ethics Committee
MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

INFORMATION SHEET

Place of study: INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN, EGMORE

Name of Investigator : DR. BHARANIKUMAR R

Name of Participant age: sex:

Hospital No:

Study title :Trends in epidemiology, morbidity pattern and outcome of children with measles in a tertiary care centre in South India

• We are conducting a study on **Trends in epidemiology, morbidity pattern and outcome of children with measles in a tertiary care centre in South India**

- Measles ranks first among vaccine preventable disease burden
- In India, measles is a major cause of childhood morbidity and mortality due to underlying malnutrition and crowding
- We are conducting a study in ICH & HC regarding trends in measles epidemiology, various morbidity pattern and clinical outcome of affected children

We request you to participate in the study

• The purpose of this study is to study the demographic profile and complications in children presenting with measles.

• The privacy of the patients in the research will be maintained throughout the study. Inthe event of any publication or presentation resulting from the research, no personallyidentifiable information will be shared.

• Taking part in this study is voluntary. You are free to decide whether to participate inthis study or to withdraw at any time; your decision will not result in any loss ofbenefits to which you are otherwise entitled.

• The results of the special study may be intimated to you at the end of the study periodor during the study.

Signature of investigator Signature of parent/guardian

Date:

தகவல் படிவம்

ஆய்வு தலைப்பு : தட்டம்மை நோயின் நோய்த்தொற்றியல் மற்றும் குழந்தைகளுக்கு நோயினால் உண்டாகும் பாதிப்புகள் மற்றும் விளைவுகள் பற்றிய ஆய்வு.

இடம் : அரசு குழந்தைகள் நல மருத்துவமனை, எழும்பூர், சென்னை-8.

ஆய்வாளரின் பெயர் : மருத்துவர் பரணிகுமார்.இர.

குழந்தையின் பெயர் :

வயது: தேதி:

பாலினம் : உள் நோயாளி எண் :

தங்கள் குழந்தையும் இந்த ஆய்வில் பங்கு பெற கேட்டுக் கொள்கிறோம்.

1. தட்டம்மை நோய், தடுப்பூசியால் தடுக்கக்கூடிய நோய்களில் முதலிடம் வகிக்கின்றது.
2. எழும்பூர் அரசு குழந்தைகள் மருத்துவமனையில் இந்நோயின் நோய் தொற்றியல் மற்றும் நோயின் பாதிப்புகள் மற்றும் விளைவுகள் பற்றிய ஆய்வு மேற்கொள்ளப்படுகிறது.
3. இந்த ஆய்வின் முடிவுகள் பற்றி உங்களுக்கு தெரிவிக்கப்படும்.
4. இந்த ஆய்வின் மூலம் கண்டறியப்படும் முடிவுகள் உங்கள் குழந்தையின் சிகிச்சைக்கு மிகவும் உதவியாக இருக்கும்.
5. இந்த ஆய்வில் கலந்து கொள்வதன் மூலம் என் குழந்தையிடம் பெறப்படும் தகவலை ஆய்வாளர் இன்ஸ்டிட்யூசனல் எத்திக்ஸ் கமிட்டியினரிடமோ, அரசு நிறுவனத்திடமோ தேவைப்பட்டால் பகிர்ந்து கொள்ளலாம் என சம்மதிக்கிறேன்.
6. உங்கள் குழந்தையை பற்றிய விபரங்கள் யாருக்கும் தெரிவிக்காமல் பாதுகாக்கப்படும்.
7. இந்த ஆய்வில் பங்கு பெறுவது உங்கள் தனிப்பட்ட விருப்பம் ஆகும். நீங்கள் இந்த ஆய்விலிருந்து எப்பொழுது வேண்டுமானாலும் விலகிக் கொள்ளலாம். அவ்வாறு விலகுவதால் குழந்தையின் சிகிச்சையில் எவ்வித பாதிப்பும் ஏற்படாது.

8. ஆய்வாளர் இந்த ஆய்வில் என் குழந்தையின் பங்களிப்பை எந்த நேரத்திலும் எந்த காரணத்திற்காகவும், எவ்வித ஒப்புதல் இல்லாமலும் நிறுத்திக் கொள்ளலாம் எனவும் தெரிந்து கொண்டேன்.
9. ஆய்வில் பங்கு கொள்ளும்போது ஏதேனும் சந்தேகம் ஏற்பட்டால் ஆய்வாளரை தொடர்பு கொள்ளலாம்.

இச்சுய தகவல் படிவத்தில் கையெழுத்திடுவதன் மூலம் இதிலுள்ள அனைத்து விஷயங்களும் எனக்கு தெளிவாக விளக்கப்பட்டது என்று தெரிவிக்கிறேன். இச்சுய படிவத்தின் ஒரு நகல் எனக்கு கொடுக்கப்படும் என்று தெரிந்துகொண்டேன்.

பங்கேற்பாளர்

பங்கேற்பாளருடைய பெயர் மற்றும் கையொப்பம்/கைரேகை (அல்லது சட்ட ரீதியான பிரதிநிதி - பங்கேற்பாளர் செயல்திறமையற்றவராக இருந்தால் / 17 வயதிற்கு கீழ் உள்ளவர்களுக்கு - பெற்றோர் / பாதுகாவலர்)

....

பெயர் கையொப்பம் / கைரேகை தேதி

நடுநிலையிலுள்ள சாட்சியாளரின் பெயர் மற்றும் கையொப்பம் (படிப்பறிவு இல்லாத மக்களுக்கு)

....

பெயர் கையொப்பம் / கைரேகை தேதி

நடுநிலமையிலுள்ள சாட்சியாளரின் முகவரி மற்றும் தொலைபேசி எண்

....

ஆராய்ச்சியாளரின் பெயர் கையொப்பம் தேதி

INFORMED CONSENT FORM

Study place: INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN

Title of the study: Trends in epidemiology, morbidity pattern and outcome of children with measles in a tertiary care centre in South India

Name of the investigator : DR. BHARANIKUMAR R

Name of the Participant: Age: Sex:

Hospital number:

1. I have read and understood this consent form and the information provided to me regarding the participation in the study.

2. I have had the consent document explained to me.

3. I have been explained about the nature of the study.

4. I have been explained about my rights and responsibilities by the investigator.

5. I have informed the investigator of all the treatments I am taking or have taken in the past including any native (alternative) treatment.

6. I have been advised about the risks associated with my participation in this study.*

7. I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms. *

8. I have not participated in any research study in the past.

10. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in this hospital. *

11. I am also aware that the investigator may terminate my participation in the study at any time, for any reason, without my consent. *

12. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the sponsors, regulatory authorities, Govt. agencies, and IEC. I understand that they are publicly presented.

13. I have understand that my identity will be kept confidential if my data are publicly presented

14. I have had my questions answered to my satisfaction.

15. I have decided to be in the research study.

I am aware that if I have any question during this study, I should contact the investigator. By signing

this consent form I attest that the information given in this document has been clearly explained to me

and understood by me, I will be given a copy of this consent document. For adult participants:

Name and signature / thumb impression of the participant /parents/guardian

Name _____ Signature_____

Date_____

Name and Signature of impartial witness:

Name _____ Signature_____

Date_____

Name and Signature of the investigator or his representative obtaining consent:

Name _____ Signature_____

Date_____

சுயஒப்புதல் படிவம்

ஆய்வு தலைப்பு: தட்டம்மை நோயின் நோய்த்தொற்றியல் மற்றும் குழந்தைகளுக்கு நோயினால் உண்டாகும் பாதிப்புகள் மற்றும் விளைவுகள் பற்றிய ஆய்வு.

இடம் : அரசு குழந்தைகள் நல மருத்துவமனை, எழும்பூர், சென்னை-8.

ஆய்வாளரின் பெயர் : மருத்துவர் பரணிகுமார்.இர.

குழந்தையின் பெயர் :

வயது: தேதி:

பாலினம் : உள் நோயாளி எண் :

..... என்பவராகிய நான் இந்த ஆய்வின் விவரங்களைபடித்து தெரிந்து கொண்டேன் (அல்லது) எனக்கு படித்து காண்பிக்கப்பட்டது. அதன் நோக்கங்களும் முறையாக அறிந்து கொண்டேன். எனது சந்தேகங்கள் அனைத்திற்கும் தகுந்த விளக்கம் அளிக்கப்பட்டது. இந்த ஆய்வில் முழு சுதந்திரத்துடன் மற்றும் சுயநினைவுடன் பங்கு கொள்ள சம்மதிக்கிறேன்.

1. இந்த ஒப்புதல் படிவத்தை நான் படித்து புரிந்து கொண்டேன்.
2. இச்சுய ஒப்புதல் படிவத்தை பற்றி எனக்கு விளக்கப்பட்டது.
3. இந்த ஆய்வினை பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது.
4. இந்த ஆய்வில் எனது உரிமை மற்றும் பங்கினை பற்றி அறிந்து கொண்டேன்.
5. தற்போது என் குழந்தை எடுத்துக் கொண்டிருக்கும் (அல்லது) முன்பு எடுத்துக் கொண்ட மருத்துவ விவரங்களை ஆய்வாளருக்கு தெரிவித்துள்ளேன்.
6. இந்த ஆய்வின் என் குழந்தையின் பங்களிப்பினால் குழந்தைக்கு ஏந்த பின் விளைவுகளும் ஏற்படாது.
7. நான் ஆய்வாளருக்கு முழு ஒத்துழைப்பு கொடுப்பேன் மற்றும் உடலில் ஏதேனும் புதிய பிரச்சினை ஏற்பட்டால் உடனே தெரிவிப்பேன்.
8. நான் இதற்கு முன் ஏந்த ஆய்விலும் பங்கேற்றது இல்லை.
9. இந்த ஆராய்ச்சியில் இருந்து நான் எந்நேரமும் பின் வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கெர்ணடேன்.
10. ஆய்வாளர் இந்த ஆய்வில் என் குழந்தையின் பங்களிப்பை எந்த நேரத்திலும் எந்த காரணத்திற்காகவும், எந்தவித ஒப்புதல் இல்லாமலும் நிறுத்திக் கொள்ளலாம் எனவும் தெரிந்து கொண்டேன்.

11. இந்த ஆய்வில் கலந்து கொள்வதன் மூலம் என் குழந்தையிடம் பெறப்படும் தகவலை ஆய்வாளர் இன்ஸ்டிட்யூசனல் எத்திக்ஸ் கமிட்டியினரிடமோ, அரசு நிறுவனத்திடமோ தேவைப்பட்டால் பகிர்ந்து கொள்ளலாம் என சம்மதிக்கிறேன்.

12. இந்த ஆய்வின் முடிவுகளை வெளியிடும்போது என் குழந்தையின் பெயரோ, அடையாளமோ வெளியிடப்படாது என அறிந்து கொண்டேன். இந்த ஆய்வின் விவரங்களைக் கொண்ட தகவல் தாளை பெற்றுக் கொண்டேன்.

13. எனது எல்லா கேள்விகளுக்கும் திருப்பதிகரமாக பதிலளிக்கப்பட்டது.

14. இந்த ஆராய்ச்சியில் பங்களிக்க வேண்டுமென முடிவு செய்துள்ளேன்.

இந்த ஆய்வில் பங்கேற்கும் பொழுது ஏதேனும் சந்தேகம் ஏற்பட்டால், உடனே ஆய்வாளரை தொடர்பு கொள்ள வேண்டும் என அறிந்து கொண்டேன்.

இச்சுய ஒப்புதல் படிவத்தில் கையெழுத்திடுவதன் மூலம் இதிலுள்ள அனைத்து விஷயங்களும் எனக்கு தெளிவாக விளக்கப்பட்டது என்று தெரிவிக்கிறேன். இச்சுய ஒப்புதல் படிவத்தின் ஒரு நகல் எனக்கு கொடுக்கப்படும் என்று தெரிந்து கொண்டேன்.

பங்கேற்பாளர்

பங்கேற்பாளருடைய பெயர் மற்றும் கையொப்பம்/கைரேகை (அல்லது சட்ட ரீதியான பிரதிநிதி - பங்கேற்பாளர் செயல்திறமையற்றவராக இருந்தால் / 17 வயதிற்கு கீழ் உள்ளவர்களுக்கு - பெற்றோர் / பாதுகாவலர்)

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பெயர் கையொப்பம் / கைரேகை தேதி

நடுநிலையிலுள்ள சாட்சியாளரின் பெயர் மற்றும் கையொப்பம் (படிப்பறிவு இல்லாத மக்களுக்கு)

....

பெயர் கையொப்பம் / கைரேகை தேதி

நடுநிலமையிலுள்ள சாட்சியாளரின் முகவரி மற்றும் தொலைபேசி எண்

....

ஆராய்ச்சியாளரின் பெயர் கையொப்பம் தேதி

PROFORMA

TRENDS IN EPIDEMIOLOGY, MORBIDITY PATTERN AND OUTCOME OF CHILDREN WITH MEASLES IN A TERTIARY CARE CENTRE IN SOUTH INDIA

Serial Number: Ip No: Date:

1.Name:

2. Age: 1) ≤ 6 months
   2) 6 to 9 months
   3) 9 months to 2 years
   4) 2 to 5 years
   5) 5 to 10 years
   6) > 10 years

3. Sex: 1) male 2) female

4. Residence: 1) urban 2) rural

5. Socioeconomic Status: 1) Upper
   2) Upper middle
   3) Lower middle
   4) Upper lower
   5) Lower

6. Month of the year: 1) February 2) March 3) April 4) May 5) June 6) July 7) August

7. Immunization Status: 1) Immunized with single dose of measles vaccine
   2) Immunized with two doses of measles vaccine
   3) Not Immunized

8. AnyChronic illness in the child? 1) Yes 2) No

9. If Yes, specify _____

COMPLAINTS

10. S.NO	SYMPTOMS	1) PRESENT/ 2) ABSENT
1)	Fever	
2)	Cough	
3)	Coryza	
4)	Conjunctivitis	
5)	Day of onset of rash	1) Day 1 2) Day 3 3) Day 3
6)	Diarrhoea	
7)	Seizures	
8)	Others (specify)	

ANTHROPOMETRY:

11. Weight:

12. Height:

13. Mid arm circumference (1 to 5 years):

14. Nutritional Status: 1) Severe Acute Malnutrition
2) Moderate Acute Malnutrition
3) Chronic Malnutrition
4) No Malnutrition

GENERAL EXAMINATION

15.

S. No	SIGN	1) PRESENT / 2) ABSENT
a)	Rashes	
b)	Koplik spots	
c)	Anemia	
e)	Lymph adenopathy	
f)	Others (specify)	

VITAL SIGNS

16. Pulse rate 17. Respiratory rate

18. Blood pressure 19. Temperature

20. Physiological status 1) Stable 2) Unstable

21. If unstable, 1) Respiratory distress 2) Shock 3) Apnea/Cardiac arrest

SYSTEMIC EXAMINATION:

22. Cardiovascular system:

23. Respiratory system:

24. Abdomen:

25. Central Nervous system:

26. Complications: 1) present 2) absent

27. If present : 1) otitis media
2) Pneumonia
3) Diarrhoea
4) Encephalopathy
5) Febrile seizures
6) Others (specify)

27. Treatment:

S.No	INTERVENTION	YES/NO
1	Oxygen support	
2	IV Fluids	
3	Antibiotics	
4	Others (specify)	

28. Duration of hospital stay:

29. Outcome: 1) Complete recovery
2) Disability
3) Death
4) LAMA

MASTER CHART

s.no	age	sex	residence	socioeconomic status	month	immunization status	chronic illness	fever	cough	coryza	conjunctivitis	day of rash	diarrhoea	seizures	others	nutrition	hepatit	anaemia	icterus	lymphadenopath y	others	physiological status	unstable	complications	R pos	oxygen	iv fluids	antibiotics	others	LOS	outcome
1	4	2	2	3	4	3	2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1		1	2	2	1	1	1	7	1
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MASTER CHART